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[The following are translations of selected articles in the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow. Refer to the table of contents for a listing of any articles not translated.]

Interview with Chief of Air Force Political Directorate Lt Gen Avn G. Benov

91SV0006A Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 2-3

[Interview with Lieutenant-General of Aviation Gennadiy Matveyevich Benov, member of Military Council and chief of Political Directorate of the Air Force, by AVIATSIYA I KOSMONAVTIKA correspondent, under rubric "Our Commanders": "The Essence of Reform: Turning Toward the Person"; date and place not specified; uncaptioned photograph of Lieutenant-General of Aviation Benov included]

[Text] ***The editorial mail clearly reflects the gay-colored palette of our readers' opinions concerning changes occurring or planned in the Air Force dictated by Armed Forces reform and by the fundamental perestroyka of the system of political support for their life and work. Some authors of letters support the idea of depoliticizing the Armed Forces and eliminating political entities. Others, to the contrary, try to show with no less firmness the need for preserving and strengthening political influence on the personnel. Many to this day have no specific position, and they consider one reason for their "suspended" state to be a lack of information on this problem. Digs of criticism for this are directed both at the editors and at Air Force political entities. Considering the readers' wishes, our correspondent met with Member of Military Council and Chief of Air Force Political Directorate Lieutenant-General of Aviation G. Benov and asked him to answer questions connected with reorganization of political leadership of the Armed Forces and specifically of the Air Force.***

[Correspondent] Gennadiy Matveyevich, the USSR Presidential Ukase on Reforming Political Entities of the Armed Forces, KGB, MVD and Railroad Troops and also resolutions of the 28th CPSU Congress provided a legal and political basis for transformations. Reform became an obvious fact. Nevertheless, passions are not subsiding over slogans of removing politics and the party from the Army. Why do you believe this is?

[Benov] If we follow the advice of Kozma Prutkov and "look at the root" of this problem, then it is not difficult to see and understand that the struggle of parties and political groupings for power which is becoming aggravated in our society includes as a component part the struggle for influence on the Armed Forces.

The calculation here is simple: whoever the Army follows will be mounted, figuratively speaking, against dismounted and unarmed competitors. In short, it is not a question of depoliticizing—that is a screen for covering true goals—but about repoliticizing. And in its first phase the task is to wrest the Army from the sphere of influence of the CPSU, the ruling party, in any way.

[Correspondent] But judging from readers' letters and from meetings and talks with military aviators and civilians, many support the idea of depoliticizing and of eliminating political entities and party organizations without pursuing either far-reaching goals or any kind of political goals at all...

[Benov] It seems to me that the position of this category of "liquidators" is determined not so much by personal convictions as by the influence of appearances in the press, on radio, on television and in various forums by leaders of opposition forces and their allies and by the influence of the broad antiparty and anti-Army campaign as a whole.

Some sincerely believe, for example, in the possibility of the existence and advantage of politically neutral Armed Forces, although this is an illusion of the first water. The idea of the functioning of a depoliticized Army is just as groundless theoretically and historically as that of a depoliticized society and nonstate forms of social development. As of today mankind is not yet ready for that level of its existence. And speaking about a trend, it is specifically the reverse process, a strengthening of politicization of the Armed Forces, that is seen throughout the world.

Some adherents of depoliticizing see in it an opportunity to eliminate or weaken the influence on the Army of the administrative-command system and of political figures not subordinate to laws and parliament, and to strengthen the constitutional-law foundations of its organizational development, combat training activity, and employment.

One asks: Just who is against this? We all are striving for it, only it is not quite correct to identify that striving with depoliticization. The Army is part of society's political superstructure, and a part and an entity of the state. It is created and directed by the state and implements state policy. I believe the majority of readers of AVIATSIYA I KOSMONAVTIKA understand this.

By what methods and under what conditions leadership of the Army is accomplished is another matter. Reforms of our society's political system and of the Armed Forces are specifically called upon to bring them into line with the laws and principles of a democratic, rule-of-law state.

[Correspondent] Readers' opinions concerning the upcoming radical reform of political leadership of the Armed Forces are far from unequivocal. Skeptical notes often sound in letters: allegedly there is much talk but everything in fact will be reduced to a formal change of signs...

[Benov] There really are many arguments and direct insinuations. Therefore one of the very first tasks of political officers, the party aktiv, military journalists and all people in general who support reorganization is to create a favorable attitude in Air Force personnel and in the friends of military aviation toward the changes and a healthy psychological atmosphere around reform. The time periods and the quality and end results of the work which has begun largely will depend on this.

With respect to the scale and depth of perestroyka one can say with confidence: there never before has been such a reform in our Army in the entire history of its existence. It is conceived as a set of interrelated, cardinal transformations in functions, structure and methods of activity of political entities and of party, Komsomol and trade union organizations. The essence roughly lies in laying out three new lateral lines of a future political system:

—Dividing political and party entities;

—Removing political entities from subordination to the CPSU Central Committee and transforming them into state-constitutional entities;

—Converting them from administrative-political entities to educational entities with a clear-cut function of social-legal protection of servicemen, Soviet Army workers and employees, and their families.

And the name—military-political entities—should reflect their role as an instrument of the state.

[Correspondent] Nevertheless, Comrade Lieutenant-General, the authors of letters and readers of the aviation journal are most interested in the question of what changes will occur in the Air Force during the reform.

[Benov] The Air Force Political Directorate now is completing work of analyzing and generalizing suggestions from the troops. The optimum variants of our decisions will be transmitted to higher echelons. I would not like to guess, let alone confuse the journal's readers, and so I request permission to return to this question a bit later.

Nevertheless, today it is already clear that the structure of Air Force political entities also will change in accordance with functions. We assume that departments and sections will become their leading subunits, and units will have officers for social-legal, information and cultural enlightenment work, for liaison with public organizations and the press, and for work with the youth. The table of organization of military-political entities naturally will include political scientists, sociologists, psychologists and jurists. This year already we have begun to train cadets at the Kurgan Higher Military-Political Aviation School in the specialty of psychologist.

[Correspondent] I would like to ask about upcoming changes in party life of the Armed Forces and the Air Force. The opinion exists that under conditions of the multiparty system taking shape in our society, political entities have prudently dissociated themselves from their "younger brother." What is your viewpoint on this part of the reform?

[Benov] Let us return to the recent past. Why were party organizations criticized more and most often? For independence of political entities. Now this will not be the case. Let us begin to build our relationships exclusively on the basis of cooperation, coordination, party comradeship and a unification of efforts.

Such experience already exists. Back on the approach to reform many political entities began to restructure their relationships with party collectives on principles of cooperation and coordination. Political officers of Long-Range Aviation and of the Volga-Ural Military District Air Force are progressing noticeably in this direction. The political department headed by Major General of Aviation V. Pomytkin has found and is precisely following its line. While comprehensively strengthening the independence of party organizations, at the same time he skillfully coordinates their activity by advice, business-like help and necessary information. The experience of consultative relationships with party organizations and the political department of the Syzran Higher Military Aviation School for Pilots merits study and dissemination.

True, there also are other examples where some political entities forsook party organizations, while others attempt to act by old methods of giving orders. Such extremes also are characteristic of a period of a break with existing relationships, but it is better not to allow them. Now as never before, we need unity in actions and consolidation of all healthy forces, above all in order not to lower aviators' political responsibility for Air Force combat readiness and the quality of combat training missions being accomplished in the reform period.

[Correspondent] Very great significance in the concept of reform of the Armed Forces political system is attached to strengthening the ties of military-political entities and party and Komsomol organizations with local party and soviet entities, labor collectives and the public. How firm are these contacts now?

[Benov] They largely depend on the situation in areas where air units and formations are stationed. Relations most often are good where the situation is more or less stable. Aviators are receiving necessary assistance and support and together they are resolving many problems, particularly of the predraft training of the youth, military-patriotic education and others.

For example, I find full understanding in Krasnodar Kray, residents of which elected me People's Deputy of the RSFSR. And not only with respect to realization of electors' mandates, but also in concern for educating the youth, elevating prestige of service in the Air Force, and training aviation cadres. It was decided to set up unique military equipment museum-pavilions in large populated points of the kray through common efforts. The country's first special boarding school with pupils' basic flight training has opened in Yeysk. There are other ideas as well. Aviators try not to remain in debt. The crews of military-transport aviation, for example, helped Krasnodar farmers deliver the fruits of their labor to areas of the Far North, Far East and Siberia. In short, it is necessary to strengthen and develop cooperation. We have opportunities not only to be supplicants, but partners as well.

[Correspondent] Gennadiy Matveyevich, the majority of readers know you from work among the troops, in the RSFSR Supreme Soviet, and from appearances in the journal and other publications. Less known are the milestones of your life and career. Could you tell about yourself in more detail?

[Benov] My service largely is typical of people of the war generation. I was born in Kemerovo in 1941 to a miner's family with many children. My father died at the front without even having seen me. Mama died in 1957. After finishing secondary school I entered the Pavlograd Military Aviation School of Basic Training for Pilots, which was disbanded a year later. I was accepted in the first course of the Yeysk Higher Military Aviation School for Pilots and finished it with honors in 1964.

I served as pilot and senior pilot in a fighter-bomber regiment in the Southern Group of Forces. I was appointed squadron deputy political officer following studies at political personnel training courses of the Air Academy imeni Yu. A. Gagarin. I worked four years in this position, then five years as chief of an air regiment political department. I headed political departments of a fighter division and of the Carpathian Military District Air Force. Since May 1989 I have been a member of the Military Council and chief of Political Directorate of the Air Force.

In 1975 I finished the Military-Political Academy imeni V. I. Lenin by correspondence and also with honors. I have mastered 11 types of aircraft and my overall flying hours are over 2,000. In 1980 I received the "Military Pilot-Sniper" qualification.

My wife is a teacher and we have three sons. The oldest is a cadet at the Lugansk Higher Military Aviation School for Navigators. The middle son is studying in tenth grade and the youngest son is a first-grader.

I am People's Deputy of the RSFSR for the 18th National-Territorial Electoral District of Krasnodar Kray and a member of the Supreme Soviet of Russia.

My attitude toward the upcoming reform of the Armed Forces political system is positive, for its essence is a turn of all work toward the person, and this now is most important.

[Correspondent] Our conversation is taking place on the eve of the 73rd anniversary of the Great October. What would you like to wish the readers of AVIATSIYA I KOSMONAVTIKA in connection with this event?

[Benov] People's faith in the Revolution's ideals was the chief motive force of the Revolution. Today it has been thoroughly undermined. But still, moving further along the path of revolutionary renewal without it is the same as accelerating an aircraft without afterburners. Therefore I would wish everyone to whom the fate of the homeland, the people, the Army and the Air Force is dear staunchness in the face of difficulties, self-control and faith in the possibility of realizing the socialist idea through radical reforms of the economic and political system and through a moral rebirth of society, of optimism, and of confidence in success.

Speaking specifically about the Air Force, I am convinced that it possesses sufficient potential to pass through the difficult stage of its development without panic and appreciable losses. Moreover, even now in the course of military and political reforms Air Force personnel have been assigned the goal to move not only to a qualitatively new level of combat readiness and military proficiency, but also to make the Air Force a highly ethical and morally pure branch of the Armed Forces. It would appear that this striving is the surest path to solving many of our problems and to reviving the people's love and respect for the Army, military aviation, and the Motherland's winged defenders.

Readiness of Pilots for Combat Discussed

91SV0006B Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 4-5

[Article by Major B. Kononenko under rubric "For High Combat Readiness": "Ready for Take-Off. Is He Ready for Combat?"]

[Text] **One often hears the following response when talk turns to a rated pilot's combat proficiency: "He flies purely, has a good feel for the aircraft at all power settings, and has no near-accident situations through his personal fault."**

But is only this the deciding indicator of combat maturity?

High flying proficiency is a very important condition for victory over a strong, experienced enemy who makes a surprise attack, but it is far from the only one. An aviator's level of tactical training and ability to act boldly and with initiative in a critical situation also cannot be discounted, for often the success of a duel in the sky depends on a promptly executed, precalculated tactical procedure, use of stratagem, and ability to take a risk in the process.

But what does "critical situation" mean? Where are the bounds of permissible risk? Wherein lies a pilot's initiative if in our time his work is regulated by the strict bounds of documents determining flight safety?

Marshal of Aviation I. Kozhedub, Triple HSU, notes: "It is known that every air-to-air combat is a supreme test of aviators' will, political and moral-psychological conditioning, courage, and military and flying proficiency.... The person who won was the person who excellently handled the aircraft and weapons, who was first to attack the enemy, who executed the necessary maneuver and who took the initiative."

Someone will say that this was during the Great Patriotic War, but is combat conditioning really in last place now in peacetime? I will cite what I believe are two instructive examples.

Senior Lieutenant V. Katkov expertly took the fighter to the range. He was faced with the mission of delivering a bombing strike against the target, but he performed cannon firing after executing the maneuver. The need for real use of weapons even without enemy opposition caused the pilot's confusion. Here is another episode. In executing the tactical control officer's commands, a pilot lost sight of the airborne target as a result of improper distribution of attention. In accordance with requirements of documents regulating flight safety, the command came from the CP to the pilot to break off. Air-to-air combat thus did not take place.

"Did not perform the assignment," "lost air-to-air combat"... These words do not always sound alarming in peacetime during combat training, except with a shade of annoyance: we performed incomplete work, but give us time and we will make up for lost time. What if such disruptions should occur during combat operations? Here there will be no time for correcting mistakes, and each of them may be irreparable.

We often say "combat training." In this concept we include brilliant air-to-air duels and sniperlike missile launches (or bomb drops) on the range and... failures which still occur at times. But the fact is, this is not quite correct, and all because the first word, "combat," connected with real opposition, often is forgotten.

Of course a peaceful sky and a conditional enemy have their own kind of effect on a pilot's mind: vigilance is dulled, acuteness in perceiving expected danger is lowered, and the desire appears not to subject oneself to excessive risk and to search for easier ways, sometimes far from honest ways, to win victory in combat.

I once had occasion to witness the following episode. The situation shaped up during an air-to-air duel where an interceptor was in an unfavorable position for an attack, and in the next moment he himself already was under the target's conditional strike. Inasmuch as the combat "scenario" did not presume an attack against the fighter by the "enemy," the aircraft parted in different directions, but after the interceptor landed and objective monitoring materials were interpreted it was learned that the pilot "won a brilliant victory." The solution was very simple, as the saying goes. The fact is that a "victorious launch" was made... against an aircraft flying ahead when coming in for a landing. The pilot explained his act simply: "A film for the record is necessary to confirm a class rating." Any commentary here is superfluous.

These examples concern pilots' lone actions, but the fact is that in addition to this they must be ready to work as a pair and as a flight. In my numerous talks with experienced combat pilot Captain S. Rastvorov the problem was raised of combat teamwork of pilots as part of groups for different tactical purposes. He always placed primary emphasis on high requirements placed on them as skilled pilots.

This is unquestionably of no small importance for winning victory in combat, which already was emphasized above, but I assume that Sergey and his comrades in winged formation cannot help but agree with the fact that a military pilot is not just a person who flies without errors and takes the missile-armed aircraft to a given point at a designated time in performing a mission in a calm atmosphere. The fact is, civil aviation pilots also accomplish such missions successfully. Without at all downgrading the role of the aforementioned qualities, I nevertheless believe that a military pilot above all is a combat pilot, a sniper, ready to enter into a clash with the enemy at any minute. I will emphasize especially: with the enemy, without quotation marks. But this in itself rarely occurs; practice in real launches and firing against controlled airborne targets reproducing the probable enemy's tactics and procedures of battle is necessary. The mission is difficult and asset-intensive, but necessary in the interests of professional training.

As past war experience teaches, the important thing in developing a combat pilot is the first combat sortie. That is where a pilot genuinely begins to understand his purpose. At times one can hear that Great Patriotic War lessons have become obsolete. Equipment was different, tactics of conducting air-to-air combat were different and so on. Individual episodes perhaps really are obsolete, but the experience of combat operations on the whole is useful even now.

Let us recall the atmosphere of complacency that formed before the war and what losses this resulted in for us. But there also are opposite examples where commanders soberly estimated the state of affairs and the enemy was met fully armed.

We are returned to this also by events of the not-so-distant past. Now, when glasnost is being introduced more and more vigorously in all spheres of our life, facts about which people earlier preferred to be silent are becoming known. For example, up until recently the public at large did not know about our servicemen's performance of international duty in certain African countries such as the Arab Republic of Egypt [ARE] in the 1970's. Even those who volunteered for such a step out of patriotic feelings did not speak about it out loud.

Here is what was related by former military pilot, now Major (Reserve) V. Kolesov, a participant of those events.

"We did not fly immediately to Africa, but to Central Asia, where there were sands, burning winds and dust storms similar to those in the ARE, for adaptation, as it is said, but most important, for training.

"Just what didn't they teach us! Tactical training; a study of the probable enemy's aircraft; we even studied'

English for pilot communications with the flight operations officer and command post. Why in English and not Russian? Because everything was secret, incognito, and no one was to know that the Arabs were being helped by Soviet pilots.

"But English was not useful. The Arab servicemen's uniforms and Arab identification symbols on the MiG's also did not help. The Israelis immediately gave us to understand that our presence was no secret to them. Russians,' they would shout over loudspeaker communications, Have you come to fight? Are there any Muscovites among you? How about Leningradites?'

"This example is not at all a digression from the main subject of our conversation. The hushing up about the probable enemy and the strong aspects of his combat equipment and arms began with just such trivia.'

"Once," recalls Kolesov, "one pilot expressed his dissatisfaction to a consultant-instructor on this score. Why this way? The latter, not in the least embarrassed, responded: In order not to frighten you with enemy equipment.'

"Thus, being in the vise of instructions themselves, the mentors, the instructors, did a disservice to their own wards. The formal approach to studying the combat situation and enemy tactics and to training to conduct air-to-air combat competently, daringly and decisively, and conditionalities of all kinds soon were not slow in having sorry consequences.

"Once Captain Bogdanov's flight went on alert duty in place of my flight," relates Kolesov. "The command for take-off came. The eight (two flights were on alert) took off headed by Kamnev, the deputy squadron commander. Without dispersing, it headed for an enemy group visible on the radar screen, suspecting nothing of possible insidiousness. The other enemy group, invisible to us and the radar operators from behind the corner, as they say, fired missiles at the MiG's..."

The conclusion follows from Kolesov's recollections that our aviators always were ready to take off and perform the mission of standing air alert, but they were not always ready for combat, for the most genuine combat, where it was required to promptly divine the enemy's plan and impose one's own will on him, where matters were decided by instants: either you destroy him or he destroys you.

In our time, when the image of the enemy is rapidly being eroded, one nevertheless should remember that not one world country is yet fully rejecting its armed forces. Armies are being kept not only for purposes of protection against attack, but also for so-called protection of one's interests at various points of the globe and assurance of spheres of influence. Such a trend will be preserved even in the future, possibly at a lower level of armed forces and arms. Reliance here is being placed above all on aviation as the most mobile means of attack. Not only local conflicts, but also special, excellently trained air units and subunits—"aggressor squadrons"—are used to maintain the combat proficiency of flight personnel abroad. They permit every pilot to feel the enemy's strength on himself and accomplish almost a real first combat mission.

On the other hand, does our military pilot today always expect real combat when he takes up a fighter or helicopter? What should be considered important in training aviators for a combat sortie? Are there criteria for evaluating a pilot as a combat pilot? There is no question that the urgency of these questions will continuously grow under conditions of reduced international tension, and professionals and scientists have to continue the conversation about this in the journal's pages.

Method for Evaluating Command and Control Effectiveness Presented

91SV0006C Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 6-7

[Article by Colonel A. Kozlov, candidate of military sciences, under rubric "The Commander and Combat Readiness": "An Assessment of Command and Control Effectiveness"]

[Text] **We often ascribe the art of tactical command and control to commanders who possess innate intuition and a special gift, but in fact its basis consists of very definite patterns of the collection and analysis of information and mathematical calculation.**

The degree of realization of potential capabilities of air formations, units and subunits, including individual crews, in combat depends largely on the organization of their command and control. This is why, along with other components of combat effectiveness, command and control effectiveness is one of the principal components of the results of combat operations.

Under actual conditions the effectiveness of battle is assessed according to damage inflicted on the enemy or according to inputs of combat power per unit of result obtained.

In case of success everyone wins and captured equipment is counted. In failures we limit ourselves to a qualitative analysis, placing primary emphasis, sometimes quite unjustifiably, on command and control deficiencies.

This also is largely inherent to a peacetime training situation where the end result of accomplishing missions facing aviation is evaluated according to corresponding standards.

Let us assume that an air regiment receives a poor grade for a practice mission in a tactical air exercise. The inspectors are in a difficult position, for the work of the

command and control entity, the command authority and staff, was graded highly for exercise preparation and organization. As a result (due to a shortage of time and the absence of accessible methodology for analysis) the unit is given an "unsatisfactory" according to already established tradition.

Everyone is at fault, many undeservedly, for in such cases the end result largely has a random nature in addition to specific patterns. It is not precluded that the result may be different if the tactical air exercise is repeated under similar conditions. As a result there is a distorted overall impression of the state of combat training in the unit and ways of improving it.

All this advances a pressing task—to develop a scientific body for comprehensive objective determination of unit and subunit combat readiness. Suffice it to say that an intensive search has been carried out in recent years for approaches to evaluating various aspects of the activity of military collectives and individual servicemen, but no generally acceptable variant has been created for now.

The methodology being proposed takes in questions of identifying command and control effectiveness, including the professional training of officials and the process of their developing and making decisions, and it concerns execution of the decision by those responsible. A criterional approach is the basis of the analysis.

Within the scope of a given command and control system the command and control effectiveness of a command and control entity is understood to mean its ability to take advantage of subordinate forces' capabilities for achieving maximum results in accomplishing missions in a specific situation.

The criteria for its evaluation are indicators according to whose numerical value one can draw conclusions about the degree of attainment of set goals.

A large number of indicators including overall, generalized, primary and special criteria must be used to estimate the command and control activity of the command authority, staffs, services and other leadership entities in preparing troops for combat operations and in commanding and controlling them in executing assigned missions.

An overall criterion describes the degree to which functional duties are realized by the command and control entity's full combat team in accomplishing a mission to the prescribed extent. It is also advisable to include the results of combat operations of subordinate troops in this criterion in order to determine the extent to which command and control contributed to the end result of troop activity.

Generalized criteria (H_i) define everything by stages of performance of the assigned mission.

Primary criteria (P_i) describe the realization of potential capabilities of the command and control entity (or of subordinate troops) along the lines of their activity in each of the phases.

Special criteria (K_i) evaluate the functioning of individual elements of the command and control system for given directions.

A quantitative computation of criteria is possible by several methods. The most acceptable method for this purpose turned out to be the calculation method in combination with the expert evaluation method, which presumes consideration of the opinions of experienced specialists and a knowledge of the mathematical relationship among indicators characterizing different aspects of command and control and troop activity.

Special criteria (evaluations), associated into groups with the help of an analytical relationship, already represent primary criteria. The latter in turn form generalized criteria, which determine the overall criteria.

The methodology which has been developed can be used in inspecting formations, units and subunits of all branches and combat arms. Let us examine its application using as an example an evaluation of the work of an air regiment's command authority and staff in preparing for and holding a tactical air exercise.

Before the tactical air exercise is held the primary criteria encompass the level of preparedness of the command post's full combat team; degree of conformity of exercise documents drawn up by the staff to directive requirements and instructions of higher headquarters; timeliness and completeness of fulfilling measures by members of the command post's full combat team while being placed in combat readiness; and the degree to which the commander's decision conforms to the objective of combat operations.

The level of preparedness of members of the command post's full combat team is evaluated based on results of a check of their knowledge of combat readiness documents, knowledge about the exercise and knowledge of their own duties, and based on tactical proficiency. Grades (special criteria) are given to officials based on exam or quiz results.

The primary criterion is determined as follows. Each position is ranked by degree of importance; the rank's numerical value describes the position's contribution to accomplishment of a given mission. A table of ranks can be produced most accurately at the present time using the expert evaluation method.

The rank of positions (R_i) also can be conditionally calculated from the formula:

$$R_i = 1 - \frac{N_i - 1}{N},$$

where:

N_i is the serial number of the position in the adjusted list; N is the overall number of positions considered.

The rank values subsequently are normed, i.e., the share of each position in their overall sum, taken to be 100 percent, is calculated:

$$R_{Hi} = \frac{R_i}{\sum_{i=1}^{N} Ri} \cdot 100,$$

where R_{Hi} is the position rank after being normed.

The **overall evaluation Pi**, representing the corresponding primary criterion, is calculated from the formula:

$$Pi = \frac{\sum_{i=1}^{N} R_{Hi} \cdot Ki}{100},$$

where K_i are evaluations of officials (special criteria) obtained during a quiz.

The list of officials, ranking, calculation results and so on are entered in Table I.

Table I

		Criteria Characteristics		Indicators	
No	Position Categories Evaluated	Rank R_i	Rank Share R_{Hi}	Quiz Grade K_i	Grade Share $R_{Hi}K_i$
1	2	3	4	5	6
1	Regimental commander	1	...	...	...
2	Regimental chief of staff	0.93	...	...	...
3	Deputy regimental commander	0.86	...	...	...
	.....	...	...	...	...
8	Intelligence officer	0.5	...	...	...
	.....	...	...	...	...
14	Chief of air weather service	0.08	...	...	...
15	Primary criterion of officials' level of training [LT]: P_{LT}				4.5

As in the first instance, in calculations of the primary criterion **of the quality with which the regimental staff worked out documents and their conformity to directive requirements**, orders, plans, instructions and so on are ranked according to their degree of importance and influence on tactical air training by means of the measures being carried out. Then their completeness and conformity to normative requirements is evaluated and the primary indicator is subsequently determined. A table similar to the first one is filled out for graphic effect.

Other primary criterion also are determined in the very same manner: **timeliness and completeness of measures in directing that the regiment be placed in combat readiness,** including actions to place the command post and command and control facilities in readiness, cohesiveness of combat teams, observance of maskirovka [lit. "camouflage", however, includes "concealment" and "deception"—FBIS], the personnel's gear and equipment, their assembly in response to the signal and so on; and **degree to which the commander's decision conforms to the objective of combat operations,** which includes timeliness and advisability of the decision, correctness in choosing the work method and so on.

The generalized criterion of an evaluation of the command and control entity's work in preparing for the tactical air exercise is determined on the basis of a ranking of primary criteria. Let us assume that they equal 4.5, 5, 3.5 and 4 respectively. Then we will obtain the data given in Table II as a result of calculations according to the previously examined methodology.

Table II

No	Elements Evaluated	Criteria Characteristics		Indicators	
		Rank R_i	Rank Share R_{Hi}	Primary Criteria P_i	Grade Share $R_{Hi}P_i$
1	2	3	4	5	6
1	Degree to which commander's decision conforms to objective of combat operations	1	40	4	160
2	Timeliness and completeness of measures in directing the regiment's placement in combat readiness	0.75	30	3.5	105
3	Level of preparedness of command post full combat team members	0.5	20	4.5	90
4	Quality with which regimental staff works out documents and their conformity to directive requirements	0.25	10	5	50
5	Generalized indicator of command and control entity's work in preparing for the tactical air exercise: Hp				4.05

During performance of the combat mission primary criteria characterize the level of training of full combat team members; status of command and control facilities; and result of combat operations.

The methodology of determining the first two is similar to that examined above. Let us assume that they have been evaluated as "outstanding." The evaluation of the result of combat mission performance is given for practical actions in destroying targets. Let it be unsatisfactory.

Then the generalized criterion of work by the command and control entity's full combat team in the combat mission performance phase is determined by ranking the primary criteria indicators. Results are given in Table III.

Table III

No	Elements Evaluated	Criteria Characteristics		Indicators	
		Rank R_i	Rank Share R_{Hi}	Primary Criteria P_i	Grade Share $R_{Hi}P_i$
1	2	3	4	5	6
1	Result of combat operations	1	50	2	100
2	Level of tactical training of full combat team members	0.66	33	5	165
3	Status of command and control facilities	0.34	17	5	85
4	Generalized indicator of work in combat mission execution: He				3.5

The overall assessment of the full combat team's work (O_{PBR}), consisting of generalized criteria in the preparation phase (H_p) and combat mission execution phase (H_e), is determined as follows:

$$O_{PBR}=0.6H_p+0.4H_e=3.83.$$

The weight factors were obtained as a result of a survey.

O_{PBR} and its components, obtained during the exercise, must be no lower than a given (standardized) level. To reduce the effect of subjective factors in evaluating different aspects of the command and control entity's work at the special criteria level requires further improvement of the given direction of work.

The cited methodology is unattractive at first glance due to the large number of different criteria and the need for elementary calculations. This is easily eliminated with the use even of simple computer equipment. Here it is sufficient to load in a certain program and the special criteria values to obtain the overall evaluation.

In principle, proper use of the proposed methodology or its variants not only will permit objectively evaluating actual potential capabilities of command and control entities and of subordinate troops, but also will provide an opportunity to eliminate biases in their training, which is especially important for large groupings, and to achieve maximum results with given personnel and equipment.

Reader Believes Ministry of Aviation Industry Does Not Impose Unnecessary Aircraft

91SV0006D Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) p 8

[Letter to editors by A. Shcherbakov, HSU, honored test pilot of the USSR, candidate of technical sciences, under rubric "Readers' Letters": "Concerning Half-Baked Monopolists"']

[Text] The article by A. Akimenkov "What Keeps Our Aircraft From Being Better," published in AVIATSIYA I KOSMONAVTIKA No 7, occasioned grief, to put it mildly, and here is why.

I have had more than one occasion to take part in flight tests under the State Tests programs together with military colleagues. I began this work in the late 1950's (together with G. Beregovoy) and ended it in the 1980's. All this time I had close contact with leading military aviation specialists. They never considered the Ministry of the Aviation Industry representation a means of pressure, a method of imposing "an unnecessary aircraft." To the contrary, we from the Ministry of the Aviation Industry and the military understood that quality results depended on our concerted, coordinated work. The fact is that flight tests and their analysis are a creative matter. There were arguments, but they did not bear a departmental nature at all, and there never were conflict situations in our practice. The ease with which Akimenkov accuses his colleagues, both those from the Ministry of the Aviation Industry as well as the military, surprises me. In his words, some falsify test results "in processing the materials of monitoring-recording gear" and others close their eyes to this out of selfish motives.

Unfortunately, he does not express such opinions only in the journal. His article "Our Costly Buran" was published in the newspaper MOSKOVSKAYA PRAVDA for 20 May. I am not about to argue with him over the advisability of the Buran. The question is very complicated. But I will note that the author does not have the necessary knowledge and information to evaluate the Buran, just as I do not. In the article Akimenkov speaks of the design of a high-altitude, subsonic aircraft, the profitability of which would be twice that of the Il-62 and which was "frozen by half-baked aviation monopolists."

I performed flight tests of a high-altitude, subsonic aircraft created in 1959 and directly encountered the problems of this concept. Such an aircraft has rigid limitations in a high-altitude flight, since the flight itself is possible only at a certain speed and its deviation both to the greater as well as to the lesser side leads to serious disturbances of controllability. Everything occurs at the point of limitations, as it were. The aircraft I tested had a narrow, special purpose. But with regard to a passenger aircraft, it is in no way possible to allow it to fly under such conditions (at the point of limitations) because of reliability and safety considerations. Questions of strength would become a serious problem of the liner.

The M-17 aircraft (our press already has reported on it) created almost a quarter-century after the model we tested unfortunately did not even reach its predecessor's tactical performance characteristics. This indicates that there is not yet a reliable solution to problems of an aircraft of such a concept. There is no need even to mention any kind of competition of the M-17 with a modern passenger aircraft.

There are many examples in the history of aviation when a tempting idea ended in failure due to the impossibility of its practical embodiment. Such also would occur in the case of the high-altitude, subsonic passenger aircraft. And one should not make out intrigues of "half-baked monopolists" in the fact that the embodiment of its project has been put off for now or in all that very difficult and very complicated matter of creating modern aircraft. Both military as well as civilian aircraft specialists are interested in their birth.

Reader Offers Suggestions for Improving Service

91SV0006E Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) p 8

[Letter to editors by Senior Lieutenant V. Yaryshin, Kiev Military District, under rubric "Readers' Letters": "Facing Earthly' Problems"]

[Text] Many articles now have appeared in the press revealing the essence and directions of military reform. They decide questions of an out-and-out global scale, but I believe they will mean little if our ordinary "earthly" concerns do not find their comprehension in parallel with them. For example, a technician who has served 25 years in the troops often is discharged in the rank of senior lieutenant. Here is where I will begin my suggestions.

It would appear that technical personnel should be given the next military rank for many years of faultless service regardless of the position held. Every aircraft technician should be given an economic incentive for supporting more than 100 flying hours a year. Give the unit command authority the right to give an additional ten-day leave to Aviation Engineering Service specialists who have supported the greatest number of flying hours and who have received no criticisms for servicing aircraft.

The time has come to revise clothing service standards, where it is necessary to proceed not from armchair theories but from the realities of life. We are dressed badly. The wear life of technical uniforms has been set at four years, but they become unfit after just two years. Lately we have begun to be issued unlined jackets, and people freeze in them. It is also bad with footwear. The felt boots are uncomfortable and it is difficult spending the entire flight operations shift (a sum total of 11 hours) in them. Many purchase fur-lined boots and flying boots

with their own money. We have no spring-fall footwear at all. In this period everyone wears what he finds suitable.

There also are complaints about the organization of meals. The food is monotonous, unpalatable and at times of poor quality. Many officers and warrant officers suffer from stomach ailments, but there is not even any talk about dietary meals. As a rule the messhalls are empty on days off and holidays. Why not issue servicemen dry rations for this period?

I realize that the housing question is acute and painful for everyone, but it would be possible to introduce benefits for Aviation Engineering Service specialists who have served for a long time in remote areas and under difficult climatic conditions.

Would a great deal of funds be required for all this? I think not. In any case, they will be repaid by increased conscientiousness of technical personnel in performing their duties, and this already is a great deal.

Ways to Facilitate Entry to Academies Suggested

91SV0006F Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) p 9

[Letter to editors by Senior Lieutenant Yu. Antonovich, team senior technician, under rubric "Readers' Letters": "Where Can the Road To Knowledge Be Found?"]

[Text] Every year it is one and the same. Young officers submit a request for permission to enter the academy, they go through preliminary selection and... they are left in ignorance: What is to be done further? Our own journal AVIATSIYA I KOSMONAVTIKA publishes only the rules for acceptance to secondary and higher military aviation schools, but for some reason the training programs and methodological instructions for those entering academies do not arrive in the units on time.

It is very difficult to come up with an optimum personal preparation plan without them. These pamphlets probably should be put out in a large edition long before the beginning of entrance exams, for they are both an aid and to some extent advertisement for the academies. If the programs are accessible to many, then I believe that more people will realistically assess their abilities and will wish to prepare and try to enter a higher educational institution.

And one more circumstance which hampers "gathering" the necessary level of knowledge. I am not even speaking about the difficulty of combining the performance of daily duties with preparation for exams: we knew what we were doing, although four hours a week (and then after 1800) of course are few. But the duty details are disruptive. Probably it should be ensured that persons who have gone through preliminary selection are relieved of details.

Air Force, Unit Economic Incentive Funds Proposed

91SV0006G Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 10-11

[Article by Major General of Aviation (Reserve) A. Bystrov under rubric "On a Perestroyka Heading": "Economic Incentives and Accident-Free Operations"]

[Text] **The existing incentive system for aviators' labor is poorly tied in with the results of their work to prevent air mishaps. A new organization of incentives and motivations is needed for prompting personnel to realize their potential job, physical and intellectual abilities to the maximum. "Live" funds are needed for this above all, some R50 million annually according to my calculations. Where can they be gotten? I suggest solving this problem in a nontraditional method: combine flight safety and cost-accounting as a single entity. I know that on reading these lines someone will skeptically exclaim: "Utopia!" But we will not hasten with conclusions...**

The experience of foremost industrial enterprises which are actively applying different cost-accounting models has shown that an economic incentive for workers depends directly on the quality of products manufactured and the saving of physical and monetary assets. Bank credit and shares are actively used in financial operations. It would appear that such experience can be useful for the Air Force.

Each year the Air Force loses many aircraft and helicopters, and flight cadres die for various reasons. These losses cost hundreds of millions of rubles and damage to morale generally is impossible to calculate. Let us assume that 30 air mishaps managed to be prevented as a result of purposeful work. In this case the saving in monetary terms will be R100-150 million. It is proposed to direct half of these funds toward incentives for the personnel of air regiments and service and support units, and for scientists involved in scientific support of accident-free flight operations.

The saving on aviation and motor vehicle fuel and lubricants, water, electrical power and depreciation of airfield-technical and radiotechnical flight support equipment is one further channel for obtaining money. But for this all of us military aviators have to renounce a free-ride mentality and finally learn to count and sensibly spend money.

I will illustrate this thought with calculations, for which we will introduce new concepts and notations: $F_{fs\ cinc}$—Air Force commander in chief's fund for encouraging flight safety, issued at year's end to air units who have not allowed air mishaps through the personnel's fault; F_{fsc}—air unit commander's fund to encourage personnel for daily effective work of preventing air mishaps; P_{bc}—bank credit which a commander can take to encourage personnel for daily effective work of preventing air

mishaps; C_{acft}—cost of one aircraft or helicopter from among those in the air unit inventory; C_{eq}—average equivalent cost of training a crew (or a pilot in single-seat aircraft) to the level of sniper or of 1st, 2nd or 3rd class; K_{aa}—air arm factor. Calculations have shown that it lies within the range of 0.03-0.04 for fighter and bomber aviation, 0.02-0.35 for long-range aviation and 0.1-0.12 for army aviation and training regiments of military schools; K_{pd}—combat and flight training program difficulty factor (it is within the range of 0.03-0.04); ΔC_{atse}—cost of saved depreciation of airfield-technical flight support equipment; ΔC_{rtse}—cost of saved depreciation of radiotechnical flight support equipment; ΔC—cost of saved aviation and motor vehicle fuel, oils, electrical power and water; ΔP_{bc}—payment of interest to the bank on credit.

The funds of the CinC Air Force and air regiment commander are figured according to the following formulas: $F_{fs\ cinc}=K_{aa}(C_{acft}+C_{eq})+K_{pd}\ (C_{acft}+C_{eq})$, (1) $F_{fsc}=K_{aa}(C_{acft}+C_{eq})+K_{pd}\rangle(C_{acft}+C_{eq})+\Delta C_{atse}+\Delta C\rangle$ $+\Delta C-\Delta P_{bc}$. (2)

Two components of the CinC Air Force fund and air regiment commander fund are identical and stimulate, first, work to prevent air mishaps, and second, performance of more difficult assignments and exclusion of oversimplification in combat training and in fulfilling exercises of combat training courses. The other values of the air regiment commander's fund stimulate the saving of physical and monetary assets.

The economic method of providing flight safety incentives has a number of features. Commanders of air regiments and structural subunits are dealing with settlements, monies, bank credit, and a flight safety management forecast. The difficulty is that personnel incentive funds are transferred from the CinC Air Force flight safety fund only at the end of the year and only in case accident-free operations have been ensured. At the same time, in order to stimulate the personnel's work to prevent air mishaps, commanders should have the necessary money reserve each day throughout the year in an amount of R200,000-300,000. To this end they have to have the right to get bank credit, which cannot be greater than the amount figured for the first part of formula (1), inasmuch as the credit itself and the interest on it must be returned to the bank at year's end.

It should be emphasized in particular that economic incentive extends to all officers, warrant officers, extended-term personnel and soldiers of air regiments and service and support subunits depending on work effectiveness and the specific contribution to preventing air mishaps. In this case leveling will be fully precluded. The allocation of three to ten percent of the amount of bank credit can be provided as an incentive for scientists for scientific support and two to five percent for personnel of the higher entity for assistance in ensuring accident-free operations of a specific regiment. The second and third parts (see formulas 1 and 2) will comprise the social development fund of the air regiment and service and support units. Monies from it are spent by decision of the servicemen's general meeting only for construction of housing and children's establishments, development of everyday social and cultural life and so on.

It is obvious that the economic incentive system places high demands on leadership personnel for end results of managing structural subunits. Therefore commanders, staffs and political officers are obligated to skillfully direct personnel activities to prevent air mishaps through the personnel's fault in order to earn the necessary amount from the CinC Air Force fund. Otherwise as leaders they may be refused subordinates' trust. Herein lies one of the features of democratization of military service under economic incentive conditions. We will perform a calculation for a front aviation regiment for graphic effect, substituting real values (in rubles) into formulas 1 and 2:

$F_{fs\ cinc}=0.03(5\ million+1.5\ million)+0.02(5\ million+1.5\ million)=195,000+130,000=325,000$, $F_{fsc}=0.03(5\ million+1.5\ million)+0.02(5\ million+1.5\ million)+25,000+15,000+30,000-0.03x195,000=389,150$.

The amount of bank credit is determined from the formula: $P_{bc}=K_{aa}(C_{acft}+C_{eq})$. In our case it equals R195,000 and is spent as follows: R5,850 on bank payments, R5,850 as scientists' incentives, R5,850 as encouragement for personnel of the large strategic formation (everything is based on three percent). Another R177,450 will be spent on personnel of the air regiment and of service and support units. The social development fund will equal R200,000 accordingly.

The economic method of encouraging accident-free operations also is good in the fact that it presumes a substantial improvement in educational work with all categories of servicemen. The fact is that Man, not gross indicators of combat training, will be its focus. The task is to disclose his capabilities to the maximum and place them in action. It should be considered that under such conditions people's psychology of thinking and motives for their actions change and a feeling of social justice in evaluating each soldier's labor is heightened. Therefore the organization of education must be built on the scientific basis of sociology and social psychology.

The transition to the proposed method of incentives for accident-free flight operations is a very complicated matter, but it is no longer possible to do things in the old way when perestroyka of the country's economic mechanism is being carried out. New ideas and new approaches are needed to a solution to this problem of state importance. Economic incentives radically change the relationships of air collectives and upper echelons of management. The regiment itself will earn money by ensuring accident-free operations and will encourage those who help it: scientists and specialists of higher staffs.

The air unit thus becomes a full-fledged socialist state enterprise to which all corresponding Soviet laws extend to the full extent. The basis of bureaucratic management

of higher organizations thereby is undermined inasmuch as they will be forced to engage in their own specific job and there will be an end to command-pressure methods.

It is competent to pose the question: Are formations needed as intermediate management organizations between the unit and large strategic formation? A military organization of the military air base type with direct subordination to the large strategic formation probably will be more acceptable. Military air bases consisting of the necessary number of structural subunits will be able to function according to laws of scientific organization of management without encouragement in the form of curses and urgings from above. These will be developing systems capable of independently stimulating the personnel's labor. It is obvious that such military organizations will make a breakthrough in the sphere of flight safety and Air Force combat readiness.

I am sure that it is already impossible to command and control air regiments and subunits at the level of modern demands without economic knowledge. Scientific forecast, price, credit, cost, money and other concepts also should become as firmly established in the practical activity of air specialists at all levels as lift, aerodynamic center, and center-of-gravity location. I know that some opponents are disturbed by the R50 million proposed to be paid annually as incentives for accident-free flight operations. I would like to especially emphasize in this regard that this is not a basis for torpedoing the idea: it is simply necessary to carve a little money out of the amount earmarked for purchasing aircraft from the Ministry of the Aviation Industry and receive a "profit" of R100-150 million as a result of purposeful, intensive work to prevent air mishaps. Essentially the purchase of approximately ten MiG-29 aircraft must be cut in order to preserve three times more of them later by properly organizing the work of preventing air mishaps. In the final account everyone will win—the Air Force, the state and the people.

Obsolete Airfield Lighting Criticized

91SV0006H Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 12-13

[Article by Lieutenant-Colonel A. Cherepnev, commander of separate communications and radiotechnical support battalion, under rubric "A Word to the Rear Specialist": "A Glimmer of Hope, or Why No One Cares a Bulb for Our Lights"]

[Text] Runway lights are desirable and attractive to every pilot like the windows of his own home. On seeing them when coming in for a landing at night or under IFR weather conditions, the pilot experiences a state in which a whole gamut of feelings is concentrated: emotional relief, confidence, satisfaction with his actions... If a varicolored garland is twinkling ahead, that means everything is in order and he is expected on the ground. But is everything in order with those who service the lights and lighting?

Sometimes here is what I fall to thinking about. Each soldier has his own authorized weapon, and success in battle depends on its quality and condition. Then just why do our "weapons"—lights and lighting—lag so much behind today's demands? It is true that now the command authority has taken up their modernization more vigorously, so that together with the new coded neon sets, more advanced floodlight vehicles and pulsed approach lights, a glimmer of hope, figuratively speaking, also appeared that in the final account matters will be corrected. Nevertheless...

During years of service in military aviation I have been faced more than once with a question that is simple to the point of absurdity but to which I find no answer. Why, when we need one piece of equipment, does quite a different piece arrive? If for example a motorized rifle regiment is authorized BTR-70 APC's, then one need not doubt that the motorized riflemen will receive specifically those inasmuch as it is this equipment that is capable of ensuring performance of the operational training mission.

But alas, everything is not that way for us. For example, permanent airfields are "covered" with a field version of lights and lighting. As a result the rules adopted in the Armed Forces for operating lights and lighting are ignored. For example, in the Signal Troops even the P-270, P-271 and P-274 cables are forbidden to be used under field conditions, but the fact is, their insulation contains solar-absorbing ash additives and they are more adapted to the soil than ours with PES rubber insulation. Naturally you would not lay a line made of the latter in the ground, and on the surface it is not long-lasting. Or take the Luch-4 system which replaced the obsolete Luch-2 and AS-59U. It turned out that the innovation has the old cable property. In a year or two the insulation is covered with cracks, due to which the system's prefailure state called "twitching" is created, i.e., contact may be broken at any moment and the gay, varicolored garland helping a crew coming in for a landing may go out. And then a pilot has no time for emotional relief...

And so electricians go along the runway and taxiways and wrap damaged cable sections with insulation. Of course it would be possible to change the cable in some sections, but for now this is not provided by guidance documents. Moreover, the spare cable ran out long ago. Frankly speaking, all this is amateurish work, an antiquated method. I believe it is time to produce a system in a fixed version: lay armored cable in the ground and set up capital lighting that will not be blown away or damaged by the stream of gases from an aircraft or the flow of air from under a helicopter's main rotor.

By the way, lighting technicians have special difficulties in helicopter units. Plug attachments, especially on Czechoslovak-made lights, are so unreliable that the

wave of air blows them away. Plugs are attached to lights by wire. As they say, necessity is the mother of invention...

In general, it may not be so with some things, but everything is in order in our country with muddleheadedness. Judge for yourselves: for a long time we also have tormented ourselves over attaching lights to the ground inasmuch as industry produces all of them with pins which, to put it mildly, are very problematical to pound into the two-meter thickness of a gravel-concrete bed near the edge of the runway. As a result, it is necessary to align the entire system after every flight operations shift because of weak attachments.

There is an extreme shortage of office equipment. In our age of cybernetics and automatic equipment, floodlight operators are forced to look at the control tower light filters for 5-7 hours fixedly without a break, awaiting the signal to turn the floodlights on or off. Our skilled craftsmen of course fabricate sound signaling by a primitive method, but everywhere it is done differently: some successfully and some not very. In this regard I would like to ask the officers in charge: "Can flight safety be made dependent on unauthorized home-made products which neither have undergone tests nor have appropriate servicing instructions?" Of course not, but we are forced to use them. The fact is, a floodlight operator fatigued from tension is fully capable of overlooking a signal light's signal. Meanwhile, a fixed system of floodlights controlled from the control tower would increase reliability and reduce the number of attendant personnel. And oh how we need working hands.

Cleaning the runways and taxiways of snow in winter and cutting grass in summer is a veritable disaster for us. Special vehicles tear cables and break glass. As a result electricians fix the damages during the day and support flight operations at night. But airfield personnel react very uniquely to all our criticisms: "We don't care a bulb for your lights!" By the way, judging from everything, it is not just they who do not care. In addition to technical problems, we have accumulated many social problems as well. The personnel labor for days under the open sky supporting flights and their safety. Nevertheless, our authorized positions in the subunits are the lowest paid. Monetary reward for a class rating is not provided to this day. We are refused entrance to the aircrew and ground personnel mess, and in the majority of cases no centralized meals are organized at workstations. And so we have to take "thermoses" to flight operations.

True, many labor organization questions are being resolved in one way or another. With the transfer of flight support units to a new base structure in which both communicators and rear specialists are under one commander, their coordination has begun to improve. Things have gone better with one master and responsibility for end results rose.

Changes which have occurred in the table of organization structure also have affected personnel attending lighting equipment. Now they have been assigned to a lights and lighting group headed by an officer. This is much more effective than scattered lights and lighting squads in radiotechnical support subunits, for previously, having "multifunctional" duties, the platoon commander frankly thought more about nondirectional radio beacons, direction-finders and markers and assigned concern for lights and lighting to the squad commander.

The quality of motor vehicle servicing also has improved. While previously only two persons, the motor maintenance service chief and technical maintenance unit technician, handled their repair in the separate communications and radiotechnical support battalion, now all these matters are resolved by the motor vehicle technical maintenance unit. Judging from first results of the work, the base structure gives communications, radiotechnical support, and lights and lighting specialists great opportunities for initiative and for upgrading the organization of labor. They only have to be used intelligently.

Better Training For Flight Aircraft Maintenance Unit Chiefs Urged

91SV0006I Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 14-15

[Article by Captain M. Vladimirov under rubric "Flight Safety: Aviation Engineering Service Problems": "Who Will Teach the Flight Aircraft Maintenance Unit Chief to Lead a Collective?"]

[Text] **At first glance this question may seem rhetorical. As a matter of fact, everything is enormously more serious. While future flight commanders, for example, are trained the very least amount before being assigned to a position, people become flight aircraft maintenance unit chiefs from inertia, as it were. A candidate for the position is selected either from among the most experienced technicians or from young engineers who have given a good account of themselves. For some reason the opinion prevails that there can be no special problems for a newly appointed leader at this level; it is allegedly not a major move: if he previously prepared one aircraft for flight operations successfully, he also will be able to organize work on four. Nevertheless, it often happens that a person who just yesterday was an outstanding technician now becomes a mediocre leader. Is this only his fault?**

At one time I had more than one occasion to work in various subunits and I admit that it always surprised me how much the demands on specialists and the organization of preparation of aircraft for flight operations varied in these small collectives. For example, aircraft shelters, workstations and tools were kept in exemplary condition in the flight aircraft maintenance unit headed by Senior Lieutenant I. Lakomkin. Even the external appearance of technicians subordinate to him was neater, not to mention the fact that their high technical culture was constantly set as an example. If you took a detached

look, the heart was pleased: a model collective, so to speak. Only the interrelationships of specialists in it left much to be desired. The subunit command authority and party organization repeatedly had to put individual officers "in their place" who flouted requirements of the Disciplinary Regulation and trampled on the dignity of colleagues.

To the contrary, no problems of a psychological nature arose in the flight aircraft maintenance unit headed by Senior Lieutenant N. Rodionov. Specialists were disciplined, worked stably and readied fighter-bombers for flight operations with high quality. At the same time, officers would repeatedly hear censure for sluggishness addressed to them during flight operations shifts. In contrast to them, Senior Lieutenant M. Sukhinin's subordinates always acted quickly and efficiently, but now and then there were near-accident incidents in the flight through the fault of technical personnel.

Why does that happen? The fact is, the people serve in the same squadron, are under identical conditions, accomplish identical missions and are guided by one and the same documents. It seems to me that the main reason lies in the fact that flight aircraft maintenance unit chiefs often have to stew in their own juice, as the saying goes, and arrange work instinctively based not on a knowledge of basic principles of commanding and controlling the collective, but only on their own meager (at times negatively deformed) experience.

It is well if an officer has managed to go through a solid school both as a specialist and as an organizer before being appointed to a position. And if not? By the way, that happens enormously more often. He will get a lot of bumps before he gets on his feet and feels at home in what is a new role for himself. But this is just half a victory. The trouble is that inasmuch as an aircraft is a crew-served weapon, difficulties in developing the flight aircraft maintenance unit chief have a negative influence both on combat readiness and on flight safety. I will permit myself the following comparison. How is it in soccer? If the goalie is reliable the entire team plays confidently. It is exactly the same in the air flight: if the chief is on top of the situation the technicians have confidence in themselves and vice versa. He only has to become confused and display indecisiveness, and discrepancies immediately will appear which disturb not only the rhythm of the flight's work but also are capable of throwing off the tempo of the entire flight operations shift. Demands naturally begin to be placed on a young flight aircraft maintenance unit chief according to the strictest yardsticks, he pumps up his subordinates in turn, and things get going... Such an atmosphere in the collective definitely will be discharged by the storm of a near-accident incident in the air, or perhaps even worse...

Yes, work experience as an aircraft technician does not guarantee against mistakes in a new position. Here is an example of this. Captain V. Samoylenko was an aircraft technician for eight years before becoming chief of a flight aircraft maintenance unit. There were not even any doubts in the regimental command authority that he would not cope with his new duties, but this was not to be. On encountering lack of execution of some subordinates, Samoylenko himself set about performing their work instead of placing strict demands on them. The officer worked, but what about the subordinates? Sensing his lack of exactingness, they began to display open unconscientiousness. As a result military discipline and the discipline of execution dropped in the flight and the collective became unmanageable. Who knows what such "tact" would have led to had not other flight aircraft maintenance unit chiefs come to Samoylenko's help. They had a serious talk with their colleague and took his development under their wing. Things got better. But what if the colleagues had given him up as hopeless? Who would have helped him in the difficult situation?

One-sidedness in evaluating the readiness of an appointee to a position told in this example, as in certain others: allegedly he knows the equipment and is disciplined, and that is enough. But little attention is given to such features as principle, exactingness, communicativeness and a proprietary grasp, although this is specifically what is very important for a leader. Such qualities come with experience. But immediately give combat training skilled organization, competence in preparing aircraft for flight operations, and pedagogic proficiency. It does not care who is appointed to a position and when. What is to be done? The conclusion is as old as the hills: leaders must be prepared in advance.

Well, just who will train the newly-made chiefs of flight aircraft maintenance units? The heads of the unit aviation engineering service? But they have exactly nothing to do with those complexities. It is also surprising that many higher officials passed through this stage themselves at one time, but nevertheless look indifferently on problems of developing flight aircraft maintenance unit chiefs. It is of course also possible to use the training method according to the principle: if you wish to teach a person to swim, toss him out of the boat in the middle of the river. Only, will every person swim ashore? But most important, will all the aircraft return to the airfield?

I also cannot bypass the following point. The flight is the primary air subunit. Here the military school graduate takes his first professional steps, masters a specialty and undergoes development as an officer. It is in the flight that combat readiness and flight safety are forged and the moral climate of the entire squadron collective is laid down. Therefore life demands turning very serious attention to training flight aircraft maintenance unit chiefs.

But this is easier said than done, as the saying goes. The fact is, however, experience is not far off. For example, flight-methods courses are held regularly with flight commanders where questions of practical activity are examined. Their professional improvement is under the unremitting supervision of the squadron and regimental command authority, which unfortunately is not the case with respect to flight aircraft maintenance unit chiefs. I will say more: that in some places the authority of these

leader-toilers does not rise above the sarcastically contemptuous word "technical assistance." Let us ponder: Just what is the cost of the degrading dressings-down, insults and "hot-headed reprimands" with which some leaders regularly regale them in the presence of pilots and technicians? All this together shakes the foundations and demolishes the basis of the aviation engineering system. It is high time to ponder the fact that many of our global problems take their beginning right here, from day-to-day "trivia."

Ask any deputy regimental commander for aviation engineering service why the problem of training flight aircraft maintenance unit chiefs essentially is not given any attention and you probably will hear in response a reference to the catastrophic lack of time, the overload of official duties and so on. The time deficit really is making itself known; nevertheless, one can agree with such arguments only in part.

Many of our troubles originate with a lack of coordination in the interworking of different services and directorates and with formalism in training. Can one really call a situation normal when, for example, the regimental or squadron engineer is forced to scrounge for spare parts and expendables and get them on his own by hook or crook? These are functions of the corresponding service, but contact with it has turned into nothing but a nervous strain. And what is the use of classes in which verbose lectures are given simultaneously both for the young and the experienced specialists? Pardon the expression, but this is the most genuine profanation. Is it not better to conduct classes which consider difficult questions of equipment servicing, analytical material on equipment failures and malfunctions, foremost procedures of specialists' work, and social-psychological problems of managing a collective?

In my view, it also would make enormously more sense to change a number of classes from the command training plan. Why not, for example, assemble flight aircraft maintenance unit chiefs in one auditorium if only once a month and discuss with them the nuances of organizational activity and exchange experience accumulated during flight operations shifts? I am sure that a frank, direct conversation will be of much benefit to young leaders. I believe that a need has matured to hold unit-level courses for flight aircraft maintenance unit chiefs. This, by the way, will not require special directions from above, and time can be found if, for example, an intelligent approach is taken to conducting aircraft servicing and maintenance days.

Who works most of all in close contact with flight aircraft maintenance unit chiefs? The deputy squadron commander for aviation engineering service, of course. It is up to him. The squadron engineer must be given a certain independence in planning and organizing personnel training, for he knows best what measures to conduct when and how inasmuch as he has an excellent knowledge of the state of affairs in the subunit and sees the strong and weak points in subordinates' work. But it is far from everywhere that you will encounter such an approach to the job. The dictatorship of instructions from above is not letting up.

And so it turns out that flight aircraft maintenance unit chiefs learn basically from their own mistakes. Perhaps this is even tolerable in some sphere of activity, but just not where it is necessary to constantly support high combat readiness and flight safety. This means it is time to draw conclusions...

FROM THE EDITORS. In publishing this article we hope to receive a response from appropriate heads of the Air Force aviation engineering service to the question posed by the author.

Memory Improvement Exercises Detailed

91SV0006J Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 18-19

[Continuation of article by Major of Medical Service S. Aleshin, candidate of medical sciences, under rubric "To the Pilot About Psychology": "Improve Your Memory"; previous parts of article in Nos 7 and 9, 1990]

[Text] We already have examined several effective methods of memorizing. Now we will tell about procedures and methods of recalling. In recreating information the important thing is to find it quickly in long-term memory and single out what is necessary from a mass of information.

The effectiveness of recall is directly dependent on how orderly the information is in the memory storage areas. For example, a person who tosses his things in a room in a disorderly way spends a great deal of time looking for what is necessary and sometimes even loses them. The task is sharply simplified if each item lies in its place or if one object before the eyes is a reminder of another one. It is important to understand that today's method of recall essentially is yesterday's method of memorization. The basic meaning of their interrelationship lies in imprinting information in a form convenient for playback.

Use of Semantic Inserts

In case of poorly organized information, the majority of people resort to mechanically memorizing it, which is both long and fatiguing.

Inputting pieces of information to memory that are poorly linked with each other and subsequently searching for them is facilitated by constructing verbal bridges between such pieces. Because of this, weak or absent inner links in material to be memorized are compensated for and reinforced by external ones which give the material added meaning (see figure).

For example, it is difficult to remember how to set the watch in the spring and fall when shifting to daylight saving time, but this is easily achieved if the phrase "spring forward" is used. The word "forward," which

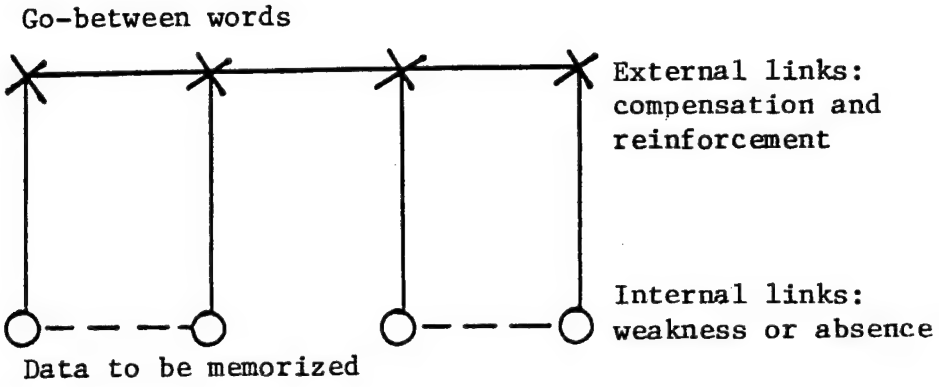


Diagram of use of semantic inserts

begins with the same initial letter [in Russian] and is in consonance with the word "spring" performs the role of a go-between connecting the beginning of April with the addition of one hour.

Let us assume that a clothing depot works in the evening on even days and in the morning on odd days. This schedule is easy to retain in memory using the words "evenings on even." Creating words and entire sentences from initial letters of material to be memorized is a good means of filling in absent links in its structure. Pilots flying the MiG-21 easily memorized the position of indicators on the T-4 panel: "marker," "cone released," "stabilizer for landing" and "trimmer effect neutral," using the sentence "My chum snatched a three."

The effectiveness of semantic inserts is indicated by the fact that all of us remember from school the sequence of the color arrangement in the spectrum of sunlight by using the phrase "each (red) hunter (orange) wishes (yellow) to know (green) where (blue) sits (indigo) the pheasant (violet) [kazhdyy (krasnyy) okhotnik (oranzhevyy) zhelayet (zheltyy) znat (zelenyy), gde (goluboy) sidit (siniy) fazan (fioletovyy)."

Some people use up to a hundred such "cribs" in their academic and professional practice.

Creating verbal chains also is a convenient method for memorizing a list of duties from regulations and manuals, sequences of actions in operating aircraft and so on which are difficult to retain in memory, especially without visual aids. Don't be embarrassed if the go-between words may seem like abracadabra to some. It has been established that the more unusual they are, the more effective is the mastery of what is being studied. Some teachers object to using such procedures, believing that this is a superficial way of memorizing and that one should assimilate the material itself and not verbal cribs. But the fears are in vain. Semantic inserts often play the role of "scaffolding" to be removed after "erecting" the necessary structure in memory.

It is advisable to use verbal go-betweens in difficult places when assimilating training material. The most successful finds are useful to set aside in the coffers of pedagogic experience.

Purposeful Imagination

Imprinting the content of various information in vivid, lively visual pictures is one more direction for improving the durability of memory. In contrast to graphic cues in structuring information, it is a question of images which approximate natural perception to the maximum and which are characterized by length of storage and ease of playback. For example, any of us can easily recall a character or fragment of a favorite cartoon from far-off childhood.

Imagination is a creative mental process, the products of which can go far beyond the bounds of reality. This is the very feature which provides its great memorizing force.

Let us assume you must not forget a list of urgent things for the day that contemplates signing an order in the personnel and supply records department, checking order in the squadron barracks, checking cadet I.'s knowledge of instructions, phoning higher headquarters, drawing clothing at the clothing depot, taking a book of regulations to the library, mailing a letter at the noon break, and repaying a debt of R25.

Let us imagine a picture. A sheet with an order the size of a soccer field descends slowly from above and covers the barracks. At the location of the window the sheet of paper tears and dissatisfied Cadet I. pokes out to his waist with instructions. He hands you the telephone and picks up the receiver. The word "DEPOT" flies out of it with a roar in the form of blinding fireworks. You run there, open the door and just manage to jump aside as an enormous book of regulations flies past you. At the instant it drops, an envelope falls from its pages. A gust of wind opens it and a 25 ruble note flies out. Play out the resulting combination in your imagination and this will allow you not to lose sight of a single one of the planned items.

CERTAIN RULES MUST BE FOLLOWED IN REALIZING THE RICH CAPABILITIES OF IMAGINATION

1. The images created should be colorful, specific and detailed. It is desirable to introduce sound effects, tactile sensations and so on to the ideas. Vague, gray images are subject to distortion and can easily be lost during storage in long-term memory.

2. An element of movement or action definitely must be present in the mental picture being constructed. Therefore toss, blow up, push away, break—chain your images to each other. This will increase their survivability in memory.

3. Working out mental images necessitates taking into account that unusual, exciting, out-of-the-ordinary events are memorized for a long time. Exaggerate and distort the customary appearance of objects. Think up the most amusing and even outrageous combinations, for no one except you will see them.

4. Make yourself an active participant in the mental sketches where possible. The images will acquire additional personal and emotional coloration because of this.

The method of purposeful imagination also can be applied with success in memorizing training material. Whether we wish it or not, our brain constantly illustrates the reading of any text, but this usually occurs spontaneously and images that arise are pale and not long-lived.

It is best to adhere to a special technology for this purpose based on the enumerated rules of imagination and called "the mental movie technique."

Let us assume you are studying the arrangement and operation of an aircraft hydraulic system. The instructions on it state: "The aircraft hydraulic system is for retracting and lowering the landing gear, trailing-edge flaps, brake flaps, and air turbine that drives the emergency power source, and for braking the wheels.

"The hydraulic system conditionally is divided into the following groups: power sources, landing gear, trailing-edge flaps, brake flaps, air turbine, wheel brakes..."

Imagine yourself to be a producer making a training film about this. The text of the instruction is the script for this film. Let us try to grasp the meaning of the text and switch on the imagination.

The aircraft is taking off. We show a closeup of landing gear and flaps retracting—everything whose work is supported by the hydraulic system. Using the cartoon technique, we outline in different colors the groups invisible under the aircraft skin: power sources, landing gear, flaps and so on. Further, from the text of the instruction we demonstrate control of the operation of individual hydraulic system groups using levers and switches. The most important parameters flare up in fiery figures and a siren whines loudly when the red "Lower Landing Gear" enunciator panel goes on across the entire screen. We imagine the tactile sensations in manipulating switches.

Now the entire text has been read and "filming" has ended. Roll through the resulting reel in your imagination. You will discover how much information was able to be kept in memory. In case of gaps in the mental picture, refer back to the appropriate place in the instruction.

That method has one other important advantage, for simply cramming instructions is not only ineffective, but also very boring. Using the imagination, however, always is creativeness, and it not only increases the effectiveness of memorization, but also turns it into an entertaining activity.

It stands to reason that in order to be successful in mentally constructing images, one has to exercise in doing this. The method of the great artist I. Ayvazovskiy can be recommended for practice.

Let us say that you direct attention to some object such as a house on your way to work. Close your eyes and try to exactly reproduce its image in color and in all details. Open your eyes and compare the mental image with the original. Repeat that several times until you achieve maximum coincidence. Gradually reduce the time of perception. As the practices go on you will notice how the vividness and precision of mental images will increase and the ability to visually grasp a large volume of information will appear, which is very important in flight operations, air reconnaissance and so on.

Purposeful imagination has been used for a long time now by many cadets and pilots in mentally running through assignments and actions in special instances during preparation for flight operations. Therefore, along with giving assistance to beginners, the above recommendations also will help experienced flight personnel improve the effectiveness of such training sessions.

(To be concluded)

Criticism of Akimenkov Article on Aircraft Design Problems

91SV0006K Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 22-23

[Article by M. Gallay, Hero of the Soviet Union, honored test pilot of the USSR, doctor of technical sciences, under rubric "Military Reform: We Discuss the Problem": "Off the Mark"]

[Text] The article by A. Akimenkov "What Keeps Our Aircraft From Being Better" (AVIATSIYA I KOSMONAVTIKA, No 7, 1990) touches on not simply an important question, but one can say almost the central question in all our domestic aircraft construction activity.

The lives and aspirations of many thousands of people working in air science and industry are devoted to its successful solution.

The author's sincere interest and passionate concern for seeing that our aircraft really become ever better and better wins a person over. He is mistaken only in assuming that he is alone in this his aspiration, or at any rate that he is on different sides of the barricades from toilers of the aircraft industry; hence the obvious biases in his conception.

An unprejudiced reader will have to conclude from Akimenkov's article that in their present state our aircraft now are unfit for anything at all and that from the "crisis of society and the economy which has gripped the country, . . . military aircraft construction was one of the first to suffer." That it suffered is without argument. Aircraft construction is not on an uninhabited island, and the defects of our development could not bypass it. But that it was "one of the first" is doubtful, otherwise we would have no grounds to place such hopes on conversion of the defense industry.

But on the whole our aviation hardly appears backward, as can be judged both from the experience of our aircraft's combat employment in various regions of the world in recent years and from direct competition with foreign aircraft at various exhibitions and shows. I believe it will be just as unproductive here to fall into unjustified self-flagellation as into self-satisfied euphoria (such as the "higher, further and faster than all" fashionable in the 1930's).

Of course, it would be incorrect—and dangerous!—to close one's eyes to the weaknesses of our aircraft construction. Aircraft engine economy and service life leave much to be desired. Aircraft equipment, especially electronics, lag behind world standards. But it would be naive to think that this occurs because scientists and designers do not realize that it is necessary to fight these weaknesses. The very same issue of the journal where Akimenkov's article appeared contained an article by V. Bezborodov entitled "Is the Rook' a Reliable Machine?" It asked a surprising question seemingly at an odd moment: "Why not make the power plant more economical?" As if large groups of designers and scientists have not been struggling with this exceptionally complicated matter (without Comrade Bezborodov's advice) for many years! By the way, certain achievements also have begun to show up in this respect quite recently.

And those same electronics! Why did our obvious lag show up there? Here it is impossible not to agree with Akimenkov that years of ignoring and, moreover, persecuting the "bourgeois pseudoscience of cybernetics" could not pass without a trace. So the reasons here are general and political, those same ones from which all our troubles, including those very far from aviation, stem in the final account.

But the primary enthusiasm of the article's author is aimed at something else.

He sees the reason for the imperfection of our aircraft to lie above all in a surprising indifference to overcoming this imperfection by those who are directly called upon to solve this task of state importance, primarily the aviation industry, which is engaged chiefly in satisfying its own (Akimenkov does not clarify specifically which) departmental interests. The accusations he expresses are addressed to many, including the USSR Council of Ministers Military-Industrial Commission, which in the author's opinion has "the full gamut of arguments . . . for defending its own (?!) interests above all"; and of course industry, in whose midst "the concept of a future aircraft already has been worked out . . . with consideration of its (apparently the aircraft's—M.G.) industrial production [Translator's note: Gallay is correcting Akimenkov's possessive pronoun; uncorrected, the word "its" refers to industry rather than the aircraft] and only last of all the requirements of air-to-air combat" and which, "taking advantage of the absence of competition . . . dictates its own will and essentially writes the request for proposal for itself," regardless of "Ministry of Defense interests, which almost always coincide fully with state interests." By the way, that departmental self-conceit, to put it mildly (in Akimenkov's opinion, there are rather few people in our country to whom interests of the Motherland are dear), is good company in the article with a not very respectful attitude also toward his own colleagues wearing shoulderboards: it turns out that their resistance to the antistate aspirations of industry representatives is paralyzed by the fact that "a refined system for encouraging compliance has been conceived. . . . Monetary bonuses, awards, and the guarantee of dustfree' work after discharge from the Army." Military department representatives, having their own personal, not-too-selfless interest in participating in joint work with industry and even realizing the impermissibility of what is occurring, "continue to play their role as if nothing had happened." Well, "if an aircraft falls from the sphere of probable application, this too is not a misfortune: the military scientific establishments of the Ministry of Defense (whose interests, in the author's opinion, are closest to state interests—M.G.) immediately think up a new sphere for its application in fulfilling the industry order."

As a matter of fact, Akimenkov painted a frightening picture: some kind of criminal conspiracy of personnel of the Council of Ministers, the aviation industry and even the military department itself behind the back and to the direct detriment of the state for the sake of satisfying their own selfish interests! It is also well that such a bouquet of terrible accusations has been expressed today, when we are moving slightly but nevertheless somehow along the path of creating a rule-of-law state. But for this in the past...

There is no question that glasnost represents the greatest (and for now almost the only) achievement of perestroyka times whose importance is impossible to overestimate. But it will be of benefit only in combination with the high responsibility of everyone who takes advantage of it and with the strict argumentation of any statement.

I do not wish to be understood to mean that I deny the presence, either in industry or the Armed Forces, of incompetent or directly unconscientious people. There are such, of course, but they do not "make the weather" in our common—I emphasize the word common!—cause. To assume that it is they who keep "our aircraft from being better" means to greatly oversimplify matters without even speaking about the moral aspect of such an approach.

Having concentrated the fire of his criticism at a fictitious or at the very least tertiary target, the author naturally also is imprecise in his individual assertions.

For example, it is difficult to agree that the preliminary specifications for creating a new aircraft "are a secondary document and form up at the tail-end of what already has been drawn up by Ministry of the Aviation Industry representatives." Since when have preliminary specifications become a secondary document? Everything begins with them! And during their discussion and approval everyone—clients and performers—have to agree to what is actually feasible with the existing level of technology and scientific knowledge, including in adjacent areas of metallurgy, chemistry, those same electronics, and many others.

Akimenkov also says regretfully and for nothing that "the concept of the future aircraft . . . has been worked out with consideration of needs (it would be more accurate to say capabilities—**M.G.**) of industrial production." How else?! We would build few aircraft in a series if we did not take this into account.

More than once life has shown that with all the need for precisely delimiting functions of participants in such a complicated matter as creating a new aircraft (according to the principle of "each carrying his own suitcase"), the creative interaction of these participants is very useful. Let us recall at least the most effective combat aircraft of the Great Patriotic War—the armored Il-2 ground attack aircraft created at S. Ilyushin's initiative in the face of the client's stubborn resistance. Or the Tu-2, the best front bomber of all World War II. A. Tupolev (who, moreover, was in prison) had great difficulty punching through the specifications for it with his high-jailer Beriya, who insisted (with someone's "help," it must be assumed) on the incompetent idea of creating a four-engine (!) dive-bomber. The phenol-impregnated modified wood mentioned by Akimenkov was used as the main construction material of the LaGG-3 fighter, again at the initiative of its authors S. Lavochkin, V. Gorbunov and M. Gudkov. By the way, it was not because "aircraft production entered a dead-end in the 1940's due to the absence of aluminum" that "phenol-impregnated modified wood was conceived"—this material was used as the main material only on one of a large number of aircraft being built then, which was clearly insufficient to take our aircraft construction "out of a dead-end."

The list of similar examples relating to more recent times could be continued, but even those given are enough to show the usefulness of involving the industry so unloved by Akimenkov's heart in all (specifically in all!) stages of creating a new aircraft. And in particular the fact that "in the course of those (field—**M.G.**) trials Ministry of the Aviation Industry representatives spend their days and nights with the troops, as the saying goes," merits no reproach. There is nothing but benefit from this both for clients and for industry workers and for flight personnel. I will refer again to wartime experience. At that time front brigades formed from personnel of plants and design bureaus were of great help to line units and they themselves received valuable experience which was used in subsequent developments.

"The developer loves new modifications"—notes the article's author, not without irony. Well of course he does! All world aircraft construction loves them. West European airbuses, American Boeings and many other excellent machines have been put out in various modifications for a double-digit number of years now. A modification permits improving aircraft performance data, sometimes very substantially, while at the same time making maximum use of all that has been approved, that is reliable and that has been mastered in production and operation. This is very familiar to every professional aviator.

"The military side . . . is drawn into joint work, thereby sharing responsibility for it," continues Akimenkov. This sounds as if the aforesaid military side is selling its soul to the devil, although, I repeat, joint work showed its usefulness long ago. But with respect to responsibility, here the article's author comes into contradiction with himself by saying: "Try to change anything, even for the better (apparently he has in mind better, in the author's opinion, than the proposed change, although he hardly can be an objective judge in this matter—**M.G.**), and the General Designer immediately intervenes. All changes are only with his permission." But then what about the lack of desire to share responsibility? And the author's negative attitude toward modifications which "developers love"? But the General Designer is a person who really is responsible for the entire appearance of the aircraft in every respect, and any attempts at uncontrolled improvisations here are impermissible and, moreover, dangerous, especially bearing in mind the "desperate insistence of authors," whose "dozens of alternatives" the author regards with unconcealed sympathy. By the way, it is true that they deserve sympathy and respect, but not enough to have all their proposals realized without the General Designer's sanction.

In short, much in Akimenkov's article seems debatable.

And it is a pity that these debatable things screen what is reasonable or at any rate what merits attention in it. It includes the problem of creating an effective feedback system capable of ensuring more intensive upgrading of aircraft, organization of an Air Force sociological service, and the idea—true, expressed in the most general form—of the need to form a mechanism of "vertical" motivation of the interests of those participating in the process of creating aircraft, a mechanism built on the

basis of using normal human motives. The proposal to organize "brigades of state experts" distinguished by the "extension of their functions (that is how it is in the article—**M.G.**) to the entire process of creating new aircraft models" is less convincing, although it too can be a subject of discussion. In principle, an upgrading of organizational forms of any work is a useful matter, but it is not clear how such an "integral" group of experts will be better than existing ones. The experience of the state acceptance system indicates rather the reverse. In passing I would like to ask Akimenkov where he proposes to get the necessary number of decent people for this group of experts if such are not provided either in the Council of Ministers or in the aviation industry or even in his own Air Force?

The author of the article began by saying that it is "a result of an analysis of many years of work by a test pilot." I too spent more than a single decade in this work. Probably each of our comrades in the profession perceives it somehow uniquely. For example, in contrast to Akimenkov, I never perceived "every flight as walking the tight-rope." I believe that by flying with such a sensation you will get no joy from flight operations and will only spoil your character.

During years of test work I had occasion to come into contact with numerous military and civilian pilots, designers, and scientists in lively work and to participate in a great number of arguments, discussions and verbal battles, sometimes very hot ones, but always dictated not by some kind of mysterious "special interests," but by considerations of the benefit to the job. And I never in any way observed an atmosphere of painful suspicion, mutual distrust and antagonism as the main, determining traits in interrelationships of aircraft creators, testers and clients.

Where do I see the dangerous aspect of Akimenkov's article?

In the fact that on reading it, young aviators may take what the author has said to be a true picture of the state of things and think that the scissors effect between what is desired and what exists (and such a scissors effect always exists, it is inherent to man's nature) is caused not by difficulties of the process of technical innovation and not by the limits dictated by the modern level of scientific knowledge and technological capacities, but by a lack of desire of this pernicious aircraft industry to work at full force and the connivance of the client's unconscientious representatives.

Exacting, mutually respectful, businesslike cooperation of creators and users of aircraft and maximum use of capabilities of science in order to optimize both requirements for aircraft as well as ways of implementing these requirements—this is what really contributes and what will contribute to our aircraft becoming better with each new design.

Interpersonal Family Relationships Analyzed

91SV0006L Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 26-27

[Article by N. Lukyanova, candidate of psychological sciences, under rubric "Confidential Service": "Problems of the Military Aviator's Family. How Are They To Be Resolved?: Spousal Communication"]

[Text] Communication in the family is a rather many-sided phenomenon. It represents the attitude of family members to each other, their interaction, an exchange of information, direct emotional contact between them and mutual emotional understanding.

The style of communication which has formed between spouses is of enormous importance for the normal life of an aviator's family. It depends on their character traits, temperament, cultural level, habits, interests and, what is very important, on the model of mutual relations which they introduce from the parents' families.

It is obvious that the similarity of their attitudes toward the most important moral and ethical values and their understanding of the standards of communication play a role of no small importance here. Nervousness, an unbalanced state, reticence, and negative character traits are poor companions of full-fledged communication.

Egotistical thinking and an inability for comprehensive and objective analysis of one's own personality is a substantial barrier in the path of spouses' mutual understanding. Surveys show that pilots frequently are inclined to overestimate their merits, while wives give themselves more modest and realistic marks.

An inability as well as lack of desire to build normal communication inevitably leads to a deterioration of communication in the family. With good mutual relations it is easy for spouses to objectively evaluate a problem which has arisen, find a sensible solution together, and endure various everyday disorders which often appear in our time of constant deficits.

Strong families are capable of withstanding a lack of convergence of opinions, moods and states. There is no question that satisfaction with spousal communication arises with good relations.

With normal mutual relations an aviator's wife always shares her griefs with her husband and in so doing receives moral-psychological support, while in unhappy families only 17 percent of wives let their husbands in on their unresolved problems and difficulties.

In life it is very important to be able to recognize both one's own mistakes as well as the right of others to make mistakes. Of course, this requires a certain nobility. Sometimes it is as if spouses forget that each of them needs kindly words of recognition, sincere approval and praise; is striving to share his or her thoughts and aspirations; and wishes to be understood. The husband or wife often neglects this. Moreover, paradoxical as it

may be, members of one's own family are practically the only people who sometimes utter offensive, insulting words.

The inability to communicate is capable of killing love and destroying the home. The culture of communication must be achieved through suffering in the process of family life. Its basic components are mutual emotional experiences, tolerance, compliance and benevolence. A special ability for communication is the capability to recognize another's value even in the face of a lack of coincidence of positions. Only in this way is it possible to preserve the desire for communication and the spouses' genuine interest in the other's thoughts and feelings and to achieve genuine harmony in family life.

The so-called egalitarian type of family in which no one dominates and no one is subordinate is becoming more and more prevalent among aviators. The distribution of rules, rights and obligations in such a family precludes anyone's dictatorship, for even the children do not tolerate violence. But a home also does not tolerate anarchy. In speaking about the family's democratic foundation, democracy often is confused with anarchy, but democracy signifies the voluntary choice of a leader by the overwhelming majority of members of a community and the right to replace him if he does not cope with his duties.

In any collective, be it large or small, there are leaders and the led. Depending on the nature of activity and conditions, one and the same person can alternately act first in the role of leader then in the role of the led. In some questions the chief decision rests with the father, and in others with the mother, but the distribution of responsibility for individual sectors of family "production" nevertheless presumes a single leading and organizing will, power and authority. This will is not presently determined by who puts how much into the family pot. It is rather the other way around. Inasmuch as the modern family is being transformed more and more often from an economic cell into a loving moral type of alliance, the head of the home is the one who embodies the most active and beneficial "doctrine" for all the household and who himself implements it consistently and purposefully. The personality of the head of a family which lays claim less and less to exclusivity and privileges and more and more assumes responsibility for the fate of all the household gradually appears.

The majority of aviators' wives would agree to preserve such an honorable mission for a strong, wise, strong-willed husband and father, and he in turn would agree without any complexes to the wife's dominance if, in possessing this strong, sensible basis, she naturally will not begin to reproach the spouse for "non-Cossack" behavior and removal from a leadership role but, to the contrary, will help him acquire his own sphere of influence in the home where his word and authority also will be decisive. This has to be done in order that the "male spirit" so necessary for normal upbringing of children really not disappear from aviators' apartments.

There are well known instances of relationships appearing in a family of aviators based only on material blessings and a love of money, which inevitably leads to conflicts, to the disappearance of love, and to alienation. Manifestations of egotistical character traits inevitably will become more frequent in those families where the material aspect begins to prevail over other interests, which means love will die out.

Happy people and families are those which do not demand immediate fulfillment of their wishes from life, those who are able and ready to wait.

Very often an aviator's family life begins with zero (no apartment, no furniture and so on), but on the other hand there is love, mutual respect, and faith that everything good lies ahead. People are rarely happy in those families where material blessings are the only values in life. Everyone has met people who are well off but who consider themselves unhappy and unsatisfied with life.

Sometimes in family life one spouse worships the other and meets his every desire, while the other takes this as proper, as a reward for his "exclusiveness." True love consists of being able not only to take, but also to give one's feelings to the closest people.

For happiness it is necessary that a person be understood at least by the nearest and dearest, but in order to be properly understood by others it is necessary above all to thoroughly understand oneself, and it is very useful here to know that neither you yourself nor someone close to you is a finished type set in one's merits and shortcomings. Human nature is sufficiently flexible and plastic, and one must be able to develop and improve it. Many useful character traits are trained just as are muscles of the body.

Spouses often erroneously believe that after marriage it is possible to turn "boyfriend" techniques and methods of treatment over to the archives. What other kind of formalities are needed between loved ones? This is tiresome. And they do not understand that preservation of mutual piety permits them to be improved themselves, to grow spiritually and not stop at what was achieved in youthful years. The fact is, any human feeling requires exercise and training. Feelings of tact, prudence, concern and courtesy can receive the best application and development specifically in day-to-day relationships with wife or husband.

With whom are we especially rude, impolite and intolerant if not with our "other halves"? How many times a day do we enjoy each other's services? And how many times do we say "Thank you"? But we do not forget to say the "magic words" to a person we chance to meet who has troubled himself merely to pass on a coin on the bus. We do not wish to appear as boors, as uneducated in the eyes of a chance companion, but we fully permit ourselves to appear as churls and even cads in the eyes of our own spouse and friend.

The most important duty of parents toward children is to be happy. For the child this is more important than the

prettiest toys, the tastiest food and the best health resorts in the country. If the child sees that Mama and Papa lack something, that child will not be able to be happy for a long time. When we say that we have everything for the children, it would be worthwhile not to forget that in doing ourselves out of our share of happiness we thereby also deprive our children of future happiness and hardly will bring up ideal citizens.

Happy families create their own world, which resembles no other. It forms gradually from numerous details; it has its own rituals and holidays. Of course, people remember here about wedding anniversaries and each other's birthdays, but these are open holidays, so to speak, in which outsiders also take part. But the fact is, there also are secret holidays about which no one except family members knows: the day when you first met, when you first kissed and so on. These holidays are no less important than marriage registration day. It can have its own rituals—a nuptial pie, some kind of special costumes.

Every happy family has its own language not always understandable by the outsider, and there also are secret nicknames. They have their own histories and their own annals, and everyone takes part in creating them, because here every matter is perceived as a common family matter.

Communication between parents and children is of enormous importance for the children's intellectual, emotional and volitional development. Children deprived of an opportunity to communicate with parents or with one of them are characterized by a low level of behavioral self-regulation, have a heightened sensitivity to any adult's communication with them, and experience difficulties in peer relationships. Mastering role behavior within the framework of their sex is complicated for such children.

In many aviators' families children have more frequent communication with the mother than the father. It is with her that confidential relationships usually form both for boys and girls, and they discuss questions of vital importance with her. But because of the father's workload, talks with him often are episodic, which substantially impoverishes the child's world of communication. Some children lack confidential communication both with the father and the mother. Children who grew up in families where close emotional contacts were not established either between spouses or between parents and children most often are in this position. The will of one of the spouses often dominates in families of this type and mutual relationships with other family members are based on orders, subordination, unsubstantiated criticism and insults. It is obvious that the way of life of such families and the style of relationships that has formed in them have a negative influence on the children's formation of an ability for full-fledged communication.

Parents are responsible for instilling in children the ability for deep human communication, inasmuch as it is in the family that the growing generation assimilates a certain style and character of behavior along with life's reference points and value ideas. And so the moral-psychological well-being of all members of an aviator's family above all depends largely on spouses' ability to communicate. But this ability is not just an innate gift; it is a matter of upbringing and self-education and the steadfast labor of the soul, to which husband and wife must dedicate their efforts from the first days of family life.

Soviet Antibomber Campaign in Korean War Described

91SV0006M Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 30-32

[Continuation of article by Lieutenant-General of Aviation (Retired) G. Lobov, Hero of the Soviet Union, under rubric "Gaps in History": "In the Sky of North Korea"; beginning in No 10, 1990]

[Text] **"Black Tuesday" and Its Lessons**

The commitment of Soviet jet fighters to combat operations had an immediate effect on the overall air situation in Korea. Their very first air-to-air combat against a B-29 showed that its high-flown name of "Superfortress" was far from reality. Recognizing its bomber's great vulnerability, the U.S. Far East Air Force command noted: "The effect of 20-mm and 37-mm projectiles (the MiG-15 had 23-mm and 37-mm guns—G.L.) is very great. A comparatively small number of hits can lead to destruction." Numerous detachments of U.S. fighters assigned for local security of combat formations, as well as screens for advance intercept of MiG-15's on distant approaches also could not ensure safety of the B-29's. Our pilots had many encounters with B-29's, each of which ended with heavy losses for the enemy, which were painful and acute for him inasmuch as the four-engine bomber was so costly. Moreover, 10-12 crew members often perished together with the aircraft.

Of course, the cannon of Soviet fighters still did not guarantee their success in combat. "Superfortresses" had their own heavy defensive weapons consisting of several twin 12.7-mm heavy-caliber machinegun mounts, and they were constantly escorted by fighters. Victory was won by proper choice of tactics corresponding to the situation, good organization, precise control of air-to-air combat, and our pilots' high individual proficiency. There are numerous examples of this.

For example, on 12 April 1951 48 B-29's under cover of several dozen fighters made a raid on a railroad bridge across the Yalu River near the cities of An-tung and Sinuiju. They were met by 36 Soviet MiG-15's. Nine bombers were downed in air-to-air combat. In the digest about which I spoke earlier the Americans wrote on this score: "Bombers participating in the raid were attacked by 72 or 84 enemy jet fighters. Three B-29 bombers were

lost and seven damaged in the fierce battle, while nine and possibly another six enemy fighters were shot down by fire of the bombers' 12.7-mm machineguns; four fighters were damaged..." One should merely add to such "objective" information that the number of attacking Soviet fighters in fact was half that. All 19 Soviet aircraft considered by the Americans to have been shot down or damaged returned to the airfield.

U.S. strategic aviation also suffered heavy losses in air-to-air combat on 30 October of that same year. The Americans themselves called this day "Black Tuesday." It really holds a special place in the chronicle of the air war in Korea, and not only because the enemy suffered a major defeat at that time. "Black Tuesday" signified something more—the total failure of U.S. strategic aviation. It was then that the enemy was forced to revise his views on use of B-29's in the Korean War. Major miscalculations in development of U.S. strategic aviation as a whole also showed up.

By the way, in writings about this battle just as about many other episodes of the war, American authors showed a biased nature, reducing their losses and emphasizing an unbelievably large number of Soviet fighters which participated in the battles and their mythical losses. This was done with the objective of maintaining at least in some way the shaken prestige of U.S. aviation, calming the public, and covering up the very gross blunders of its command authority, the shortcomings of combat equipment and the extremely low morale of flight personnel.

The journal NEWSWEEK wrote: "Losses were 100 percent. These were the losses suffered by B-29 bombers on Black Tuesday,' when eight bombers made a raid escorted by 90 fighters..." We read in the digest "U.S. Air Force": "Up to 200 fighters swooped south from behind the Yalu River against B-29 bombers making daylight raids. Losses were very heavy: five B-29's were shot down and eight others received serious damages in battle; 55 crew members were killed or missing and 12 wounded." But in order to somehow smooth over the negative impression from the forced admission, the authors note that "not in a single raid did the bombers divert from their targets because of fierce air defense." In addition, data are cited here as if by chance that from July until the end of October 1951 11 MiG-15's were shot down and another 4 fighters probably were shot down by the fire of B-29 bombers.

How was this air engagement conducted and with what forces? What were its actual results and operational consequences? In this case the term "air engagement" is not used because some 270 aircraft simultaneously took part in the clash, but in connection with the consequences to which it led.

In organizing and directing the strategic bomber raid against Namsi Airfield, the Americans made major miscalculations which we tried to take advantage of. Their nature clearly attests to the operational and organizing abilities of the U.S. Far East Air Force leadership at that time inasmuch as aircraft of two air forces—20th and 5th—took part in the clash.

And so, in my view, three essential mistakes in organizing the raid predetermined the enemy's defeat.

The first was that B-29's proceeding from the east coast to bypass the radar field of our radars located near Pyongyang and Anju had a large number of F-84 and F-80 fighters in close escort flying at an altitude of around 8,000 m. Detection of large groups of fighters at a distance of 200-250 km from An-tung and their flight at high altitudes were the first signal for us. The nature of their flight gave away the bombers beneath them, although there still were no blips on radar screens from the B-29's themselves. The fighters were proceeding at flight speeds of 720-800 km/hr in zigzag courses with a clear-cut route axis. Measurement of the general rate of the aircraft's displacement over the terrain showed that it was 400-420 km/hr. Everything became understandable: the data received coincided with the cruising speed of "Superfortresses." Now it was not difficult to conclude that a group of B-29's was proceeding from the east coast of Korea under strong cover of fighters operating by the close escort method.

The enemy's second mistake was that the approach time of the F-86 fighter screen was calculated without consideration of our capabilities of detecting the B-29's and making the decision to scramble MiG-15's for intercepting the bombers. Our aircraft already were airborne by the time there were indications of the departure of F-86 and F-84 fighters from the Suwon and Kimpo airfields, proceeding by the shortest route and at maximum speed to the An-tung area as a screen, i.e., to attack the MiG's taking off and gaining altitude. They moved toward the B-29 strike element using fuel from suspended tanks.

The monitoring of enemy crews' radio traffic permitted establishing that the fighters had the callsigns "Titmouse" and "Robin," i.e., both fighter wings. Joint operations of F-86's and F-84's of two formations simultaneously permitted the assumption that the B-29 raid was being made against some important target in a zone close to MiG basing facilities and that a large group of strategic bombers would take part in it. We also precisely determined the strike target.

It must be said that the Americans reacted extremely sharply and rather promptly to attempts to restore demolished airfields and build new ones on North Korean territory. In this respect they acted very intently and, from a military standpoint, in a well thought out, rational manner. Air reconnaissance of such targets was carried on constantly and thoroughly and as a rule a strike would be delivered by the time their construction or restoration was completed. Bomber forces thus were economized and most effective results were achieved. On the eve of "Black Tuesday" the enemy conducted intensive reconnaissance of construction at Namsi Airfield, which was nearing completion. Other indirect data

and the flight axis of the B-29 strike element permitted us to determine that Namsi Airfield specifically was the most probable strike target.

The enemy's third serious miscalculation was that the close escort fighters were in dense groups near the protected "Fortresses" and were flying at relatively low speeds. They therefore could not substantially hamper the approach of MiG-15's to favorable initial positions for an attack or our fighter attack itself. This allowed us to outline an effective plan for air-to-air combat.

The Americans used 21 B-29 aircraft in the raid and around 200 fighters of various types for their support. We had only 56 MiG-15's at the An-tung and Miaogow airfields. Twelve aircraft were left in reserve in case the enemy penetrated to the crossings and to cover the airfields, and 44 were committed to this air battle.

Considering the delay in arrival of the F-86 screen and the bad alignment of close cover, we assigned no special elements for engaging enemy fighters. All MiG's were targeted at striking only the bombers. We also decided to operate not in large elements, but simultaneously in a large number of pairs, granting them independence. Their efforts were coordinated only according to the actual targets, the B-29's. This allowed our fighter pilots to develop maximum speed, and each pair to act with initiative and maneuver freely.

We succeeded in intercepting the enemy on approaches to Namsi. While the F-86 screen was looking for our people near the Yalu River, the fate of the battle and of the B-29's was decided. Diving swiftly through the formation of close support fighters at a speed of around 1,000 km/hr, 22 pairs of MiG's attacked the bombers. The enemy was hit by 132 rapid-fire aircraft cannon. The covering F-84 and F-86 fighters, which themselves were threatened with destruction inasmuch as the MiG's were piercing their combat formations, turned aside in panic. Four aircraft which dawdled in executing the maneuver were immediately shot down.

The very first MiG attack was crushing. Losing burning and falling aircraft, the B-29's quickly turned away to the saving sea even before approaching the target.

Inasmuch as the route of the "Fortresses" lay only 20-30 km from the coastline beyond which we were prohibited from operating, some of the bombers succeeded in withdrawing. According to one B-29 navigator who took part in this raid and later was captured, there were killed and wounded on all the bombers which survived the MiG attack on "Black Tuesday." How can one not recall here once more the Americans' statement that "not in a single raid did the bombers divert from their targets because of fierce air defense."

Not one bomb fell on Namsi Airfield in this raid. The Americans did not "divert," but fled in panic, if one can apply this word to enormous four-engine strategic bombers. By the way, a reconnaissance aircraft which was to confirm results of the airfield bombing by photographic verification also was shot down in this battle.

The purely quantitative results of the battle were as follows: according to our data the enemy lost 12 B-29's and four F-84's. Many aircraft were damaged. We lost one MiG-15 in combat with an F-86, but over territory of the PRC, whose border the Sabres violated.

Striving to soften the failures of their aviation after any air-to-air combat with the MiG's, the Americans would emphasize our heavy losses from B-29 fire. In fact, paradoxical as it may sound, neither in this nor in other battles did we suffer a loss from bombers' defensive fire. The reasons for this of course do not lie in the fact that it was impossible to shoot down a MiG-15 with the fire of 12.7-mm heavy-caliber machineguns, for there were losses, and no small number, from those same weapons in battles against enemy fighters and fighter-bombers.

Fire opposition against B-29's always favored the MiG-15's for several reasons. Our cannon had considerably greater range of effective fire and destructive power than the heavy-caliber machineguns of B-29's. In addition, the "Fortresses" had very poor survivability. The bombers' computing mechanisms and the machinegun mounts themselves did not ensure aiming and effective fire against fighters attacking at a high closing speed (150-160 m/sec). The attack itself lasted only 3-4 seconds.

Consequently, the main reasons for heavy defeats of U.S. bomber aviation were the significant superiority of Soviet combat equipment, high tactical and fire proficiency, and personal courage of our pilots, who skillfully used the advantages of their own aircraft and the shortcomings of the enemy.

The results of "Black Tuesday" shook the U.S. Air Force command and alarmed the U.S. Armed Forces supreme leadership. Highly placed emissaries urgently arrived in Korea from the United States to investigate the reasons for such a grave defeat and to take steps. For three days not one U.S. aircraft appeared at all in the MiG area of operations. After about a month the enemy apparently decided to check out his conclusions about the possibility of employing B-29's during the day in areas where they might encounter MiG's. Sixteen of our fighters intercepted three B-29's screened by several dozen F-86's on approaches to the crossings near Anju. All bombers were shot down and we had no losses.

Convinced that even the steps taken to protect the "Flying Fortresses," including covering them with hundreds of fighters, could not keep them from hard-hitting attacks by Soviet fighters, the enemy had to give up using B-29's entirely during the day. Here is how the Americans themselves assessed such a decision.

An article published in the U.S. NAVAL INSTITUTE PROCEEDINGS on 6 April 1952 entitled "Lessons of Air Battles in Korea" states: "The MiG-15 essentially is a deadly weapon for our present types of strategic bombers. Our Air Force clearly made a serious miscalculation by making production of the B-36 and B-50 the basis instead of engaging in the development of jet bombers first of all. An increased number of escort

fighter elements did not solve the problem presented by the MiG-15. Korean War experience shows that covering slow-speed bombers with jet fighters essentially is useless: enemy interceptors dive through the combat formations of escort fighters, which are forced to fly at slow speed, and shoot down the bombers they are covering..."

Of course, it is up to the Americans themselves to evaluate the development paths of U.S. strategic aviation and the reasons for their defeats. All this already is in the past, but I assume that had there been jet bombers in place of the B-29's at that time, the result would have been the very same. It would appear that one principal reason for the heavy losses was the conservatism of the U.S. Air Force leadership's thinking. It mechanically transferred methods of supporting bombers of World War II times to the new conditions and paid severely for this.

It was not only that escort fighters were flying at insufficient speed; something else was important: where and how they were disposed in combat formations. Close cover tactics based on use of "cutoff" fire has disappeared into the past. We understood this; therefore the MiG's boldly penetrated the numerous covering detachments without paying attention to them and destroyed the bombers. The Americans might have pondered why the Russians assigned no forces for immobilizing escort fighters in battle, but in this case the U.S. air command clearly lacked insight.

But for us the result was important. Soviet pilots inflicted a severe defeat on U.S. bomber aviation and forced it to give up daylight operations, which sharply reduced combat effectiveness and operational capabilities of their employment in the Korean War.

The transfer of all B-29's to operations only at night generated an immediate reaction from our side. We quickly rearmed the night fighter unit from piston-engine La-9's to MiG-15's, which also had no onboard radar sights and devices, but their greater speed permitted closing with B-29's faster, and this was of enormous importance under conditions of a small light field. In addition, compared with the La-9 the MiG-15 had more powerful armament, which permitted destroying a B-29 in the first attack. This was very important inasmuch as the enemy quickly moved out of the searchlight beams and there was no longer time for a repeat attack.

After several "Fortresses" were shot down at night, the Americans took a number of new steps to ensure their safety. Bombers were painted black on the underside. The enemy began to use light B-26 "Invader" bombers simultaneously with the B-29's; their objective was to neutralize searchlight stations from low altitude. But we immediately armed searchlight crews with heavy-caliber antiaircraft machineguns for their protection. The Americans began to use all-weather F-94 fighters equipped with radar search and aiming devices in order to oppose the MiG's, but this, too, proved insufficient. Then B-29's began to appear in the area of our searchlight fields at night and only in cloudy weather.

Soviet fighters had few encounters with the B-26's, but all of them ended with their destruction. Realizing that there was nothing here to use in opposition and also for purposes of continuous pressure on enemy lines of communication, the enemy completely shifted the light bombers to night operations, chiefly against motor transport movements of troops and cargoes. It should be admitted that in organizing such strikes the Americans' tactics were very sensible. Individual sections of roads were assigned to specific crews. As they studied the terrain they reduced flight altitude and operated more effectively, inasmuch as hitting small targets from high altitudes was categorized as a random event.

But we simply could not cover even the most important roads with searchlight fields and AA. This demanded a large number of personnel and equipment, which we did not have. Using fighters without radars at low altitude and in mountainous terrain as well was precluded. After pondering the problem which had arisen, we had to undertake an innovation previously not encountered in combat practice.

We established several combat groups consisting of a platoon of searchlights and a battery of 57-mm automatic guns. Each such group (we called them "roving" groups) was given its own road sections and changed positions daily. Not knowing where he would encounter fire this time, the enemy was forced to raise the altitude of flights, which immediately decreased his combat capabilities, especially for using napalm. As a result, this primary weapon of the B-26 lost its effectiveness to a certain extent and machinegun fire became entirely useless.

At first glance it will seem curious, but bomber crews began to fear not so much the antiaircraft fire as being blinded by searchlight beams, which led to loss of spatial orientation and collision with cliffs and mountaintops at low altitude. But although we did reduce the effectiveness of their use, we just were unable to fundamentally solve the problem of combating B-26 night bombers because of the absence of necessary personnel and equipment.

(To be continued)

Ejection Seat for Future Helicopters

91SV0006N Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 38-39

[Article by designer B. Gubarev under rubric "Innovations of Aviation Equipment": "Ejection Seat for... a Helicopter"]

[Text] Since the appearance of the first helicopters aircraft designers have been seeking methods for saving crews in emergency situations. Calculations and experiments have shown that the following should be among

the most effective: landing the helicopter in the main-rotor autorotation mode, jumping with a parachute, and ejecting.

Nevertheless autorotation, which began to be used for these purposes first, can far from always ensure survival. The fact is, 95 percent of emergency situations occur at altitudes up to 500 m and at flight speeds below 200 km/hr, and over half of them are at a height of around 50 m and a speed of less than 145 km/hr. Combat helicopters are "pressing" to the ground more and more and in a critical situation simply do not have time to cut speed to an acceptable value in order to make a safe landing in an autorotation mode.

When they fall from small heights (up to 12 m), crew survivability can be ensured using shock absorption by structural elements: landing gear with increased energy absorption, shock-absorbing seat, collapsible lower airframe and so on. But a major role here is played by the helicopter's spatial attitude at the moment it impacts the ground. Considering this condition and the human body's ability to endure shock loads, it is possible to save the crew only in 50 percent of all possible cases of a helicopter's spatial attitude in an impact with the ground.

The parachute is an irreplaceable means of saving the crews of other types of aircraft—it cannot be used in a helicopter accident in the majority of cases because of the low flight altitude and danger of crew members colliding with rotating main rotor blades.

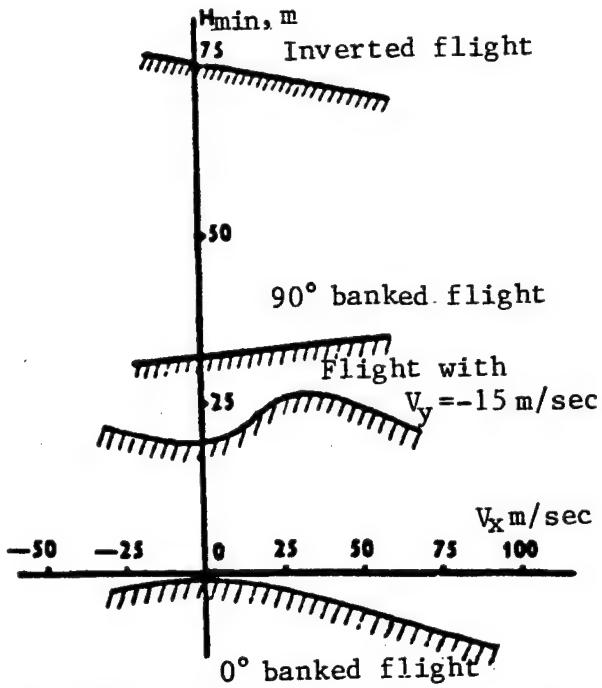
The requisite height for jumping from a helicopter in a hover mode is at least 50-60 m. Fast-acting devices must be used for deploying the canopy, but they are absent on series-made parachutes. In addition, it should be taken into account that with the failure of one control channel, in just 2-3 seconds a helicopter may achieve such a spatial attitude that it becomes unsafe to abandon even with sufficient altitude.

The above leads to the conclusion that a crew survival system must be fast-acting and capable of operating in a broad range of altitudes and helicopter spatial attitudes. Ejection fully meets this requirement.

One of its possible versions is firing the seat downward on a tether attached to the helicopter with subsequent use of a rocket-assisted parachute system, but an altitude reserve is needed for this. Another version is ejecting crew members upward with a preliminary turn of the main rotor plane of rotation or between the rotating blades. But neither has found application because of the complexity of technical realization and increased crew risk.

The preference for practical use was given to the method of upward ejection using a rocket-assisted parachute system and firing off the main rotor blades.

While tests of firing off the main rotor blades in flight were conducted on the Mi-4 helicopter in the 1950's, the development level of equipment of that time did not allow solving this problem. In particular, a reliable



Lower limits of minimum heights H_{min} for rescue in various flight regimes

system for protecting the pyrotechnic charges from false triggering failed to be created and the pilot was justly fearful that the blades might be fired off accidentally in flight. Work was stopped.

Designers were able to return to realization of this idea many years later, when experience had been gained in supporting the faultless functioning of aircraft systems and survival equipment.

Together with the Zvezda Machinebuilding Plant, the OKB [Experimental Design Bureau] imeni N. I. Kamov developed a rocket-assisted parachute system using the experience of operating the well-known K-36 ejection seat. The rocket-assisted parachute system and the device for firing off blades were joined in a single functional system. When the ejection handles are pulled, the bolt of a pyrotechnic mechanism triggers and the pilot is automatically drawn toward the back by the seat belts, then the push engine lock unlocks and a signal is sent to fire off the blades and open the crew cockpit canopy doors.

After the doors are open a signal is sent to start the push engine's first stage. In separating from the helicopter body, it pulls out a halyard; in the process the push lock is released and the lock holding the seat back to the rail guides is opened.

The engine second stage is switched on and the pilot and seat are pulled from the cockpit when there is a certain tension force on the halyard. As the back moves along the guide rails, a device which backs up activation of the parachute is unlocked.

A back separation mechanism is switched on and waist and shoulder belts are cut along the flight path. The pilot is free, the parachute pack opens, the rescue parachute canopy cover flies off and it fills from air pressure.

The system ensures rescue of a crew in a broad range of speeds, altitudes and helicopter spatial attitudes regardless of flight regimes, including essentially from a standing position on the ground.

There are provisions for autonomous separation of the pilot's attachment system from the seat in case of emergency abandoning of the helicopter cockpit on the ground or in flight without ejection. When in flight in this case the pilot resorts to jumping with a parachute.

Thus in combination with autorotation and absorption of impact energy by structural elements, use of the ejection seat permitted, for the first time in world practice, creating a comprehensive system of equipment supporting both a forced emergency abandonment of the helicopter by the crew in the air as well as crew survival with the rotary-wing craft's impact with the ground.

While all preceding systems ensured rescue only in controlled flight, this one also permits saving the crew in uncontrolled flight, which is especially important for combat craft.

The system has been prepared for series production and will appear in advanced domestic helicopters in the near future.

Problems with First Proton Satellite in 1965 Discussed

91SV0006O Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 90 (signed to press 23 Oct 90) pp 44-45

[Part One of article by Colonel (Reserve) I. Zamyshlyayev under rubric "Supporting Space Flights": "Signal Suitable for Processing..."']

[Text] **The launch of the first of a series of superheavy Soviet Proton satellites took place on 16 July 1965. This event marked the appearance of the new booster rocket by the same name. Both joys and disappointments contributed to the flight. True, few knew about the latter. Colonel (Reserve) I. Zamyshlyayev, a participant of those events, tells about the work by personnel of the Space Command, Control & Telemetry Complex.**

The department in the Space Command, Control & Telemetry Complex where I ended up in 1964 was the lead department for Proton satellites. The word "lead" signified that it was responsible for everything connected with the preparation and immediate control of these satellites in orbital flight. It was headed by Colonel P. Kryukov.

Pavel Petrovich's path to science began in Germany when he studied German rocket technology under the direction of S. P. Korolev. Then he worked in a major scientific research institute, defended a dissertation and arrived in the Space Command, Control & Telemetry Complex through his own will. An exceptionally conscientious and modest person, he was one of the few leaders who, twice in my memory, refused higher positions offered him. He sincerely loved his work, which could not help but generate respect for him.

Another remarkable trait of my department chief was his attitude toward subordinates. Many leaders even today consider it the norm for themselves to dress down a subordinate for any inadvertence in a well trained voice and in the presence of people or to drop some kind of phrase in passing with a hint, as one wit put it, about "intellectual imperfection." This is even considered a display of liberalism: he did not punish, but scolded in a fatherly manner. Pavel Petrovich was not such a person. He never allowed himself to become irritated, let alone vent his anger at subordinates or even indirectly wound a person's dignity. Our chief, as we called him behind his back, was sickened by the very thought of humiliation. But he always encouraged initiative, independence and creativeness in everything, giving each person an opportunity to sense his involvement in a cause of great state importance.

Now it is customary to speak primarily in a negative manner about the past, but honestly speaking, my hand is not lifted to write something bad about our collective. Everyone worked not out of fear, but out of conscience, and no administrative pressure is capable of forcing a person to express himself in that way. It was very interesting work, since we felt a constant rivalry in space with the United States. In May 1964 the new American Saturn 1 booster rocket was successfully launched, capable of inserting a 10.2 ton payload into near-Earth orbit. The United States had moved ahead in booster power. Now it was our turn. We impatiently awaited the launch of the booster rocket designed by V. Chelomey, capable of inserting a new satellite weighing more than 12 tons.

We spent days and nights at the enterprises and in the design bureau in the period of preparation for the Proton launch. We studied its arrangements, onboard systems and control documentation. And the closer it came to the launch, the greater the interest shown in us by the satellite's developers and USSR Academy of Sciences representatives. The procedure for collecting and delivering data to processing points, operational onboard system status monitoring, issuance of control commands and so on were clarified. In associating with representatives of science—and as a rule these were very interesting people who were enthusiastic about their jobs—we realized that they were expecting a great deal of the Proton: the possibility of detecting quarks, particles with a fractional charge, was not even precluded. All this excited people and heated up interest in the upcoming launch even more.

Finally this day or, more accurately, the night of 16 July 1965, arrived. At that time the Space Command, Control & Telemetry Complex Center had taken shelter in one of

the spaces temporarily given it on Komsomolskiy prospekt in Moscow. Among ourselves we called it by the old name, Khamovniki. But that night, inasmuch as the arrival of important guests—responsible officials of the CPSU Central Committee, Council of Ministers and ministries—was presumed, we ended up in Ministry of Defense building No 1 in the famed Room 169. As a rule, at that time it was from there that prestigious space objects being launched were controlled during the first days.

I well recall how people were excited after taking up their workstations in two-hour readiness. That is how it always is when you have been long awaiting and preparing for some important event: there it is, close at hand, but its outcome is not yet known. The presence of distinguished guests before whom we would have to work intensified the agitation, but the important thing was that we very much wanted to see an announcement reappear in newspapers' foreign comment section: "The Russians are ahead again." I remember how hideously the final minutes before the launch dragged on, how long the seconds of the booster rocket's boost phase seemed, and what excitement gripped everyone when they heard over loudspeaker communications: "Object separation!" And there was something over which to be happy and to admire—everything succeeded the first time: successful test of a new launch position, of new engine units and of the booster rocket as a whole that was more powerful than the Saturn 1. But we did not have time for this: the craft was in flight and now it was our turn.

Above all we had to confirm that it had been inserted into the desired orbit and the gear was in working order. After this the draft TASS Announcement would be refined and then everything would follow the standard technological cycle: periodic monitoring of the status of onboard systems, orbit update, issue of necessary control commands to the satellite and reading of scientific data. But this was later; now we were promptly contacting ground telemetry monitoring stations. We were ensuring that trajectory data was coming from the stations to the Computer Center and that ballisticians had no complaints about it for now. But then something was not right with onboard telemetry—the ground stations were not receiving its signals for now. The first revolution ended or, more correctly, that part of it which passed over USSR territory in the zone of visibility of eastern ground telemetry monitoring stations. Then reports began to come, now officially, that the telemetry stations (these were RTS-9's) were not receiving the signal. Our mood fell; was it really a "bobik"?

In our jargon "bobik" is a nonstandard situation. Its reasons might be of the most varied origin and importance. Mistakes by attendant personnel in the Center or at the ground telemetry monitoring stations were the most terrible or, more accurately, inexcusable. But failures aboard or of ground equipment during a session, undetected errors in documentation and so on also were the very worst. A mission controller always had to be ready for "bobiks." His main purpose lies in the ability to promptly detect signs of a nonstandard situation, determine the reasons for its appearance and take steps to remedy it or reduce its consequences.

When everything is going as it should, the duty shift's task is to monitor fulfillment of the planned program and act according to documentation. But in case of deviations from the norm, the diversity of which cannot be encompassed even by the most complete instructions for nonstandard situations, creative, intensive work obligatorily begins for those responsible for control and use of the vehicle. In the simplest cases steps are taken promptly by personnel of the duty shift itself, but in more complicated situations specialists from appropriate organizations are brought in.

The analysis of reasons begins with the simplest suppositions. That is what we did then. Above all we checked the frequency on which the stations were receiving and whether or not the target designations issued to them corresponded to the vehicle's actual movement. Everything was normal. We began to await the second revolution, in which a greater number of stations were activated and the overall zone of line-of-sight radio communications was longer. The ground telemetry monitoring station in the Crimea was supposed to be the first to enter into communications with the satellite. It had favorable conditions for reception—a sufficiently lengthy zone of line-of-sight communications and an experienced crew. Then came the ground telemetry monitoring station in Podmoskovye and further along the satellite's path, the Siberian points.

While the vehicle was in the Southern Hemisphere, it was announced at a conference of the operations group headed by our chief and with the participation of specialists from developing enterprises and ground services that according to preliminary Computer Center data, the space vehicle had been inserted "into an orbit near that calculated." Thus the Proton was proceeding according to calculated target designations and the ground stations should have detected its signal back on the first revolution. Fulfillment of the primary mission—receiving unique scientific data—now was in question. Mentioned as possible reasons for the absence of a signal was a transmitter failure in the first set of telemetry gear (there were two aboard) or a weak signal level due to a drift in its frequency.

On the second revolution it was initially decided to try to pick up the telemetry signal with the first transmitter set switched on, then shift to the second set if necessary. We checked the readiness of telemetry stations at the ground telemetry monitoring stations, planned the issue of commands for switching on the reserve set of onboard telemetry from the Podmoskovye ground telemetry monitoring station, and gave crews the mission of searching for the signal by frequency and in space. The space vehicle passed through the Crimean site's zone at the calculated time, the trajectory measurement station was on receive, but the telemetry station did not detect the signal. It was the very same picture at the Podmoskovye ground telemetry monitoring station.

A command was issued to shift reception from the main set of onboard telemetry gear to the reserve set, a search was again made for the signal, but the result was the very same. The Siberian ground telemetry monitoring stations also were operating in the very same mode, and they too had no signal. On the third revolution we decided to perform a cross-switching of individual units of both onboard telemetry sets and connect more effective antennas to the ground stations at the sites, but it all was for nothing. Sessions were held under similar programs on the fourth, fifth and sixth revolutions, but the result was all the same.

Meanwhile the object had departed for "deaf" revolutions, i.e., not passing through the zone of the ground telemetry monitoring stations on USSR territory. A temporary "window" appeared for detailed analysis of existing data and for working out strategy and tactics of further actions for control of the Proton. No one left despite the sleepless night. Kryukov had to send those who had the next 24 hours of duty off to rest. Controlling a vehicle costing several million rubles was a matter of exceptional importance, and not the slightest mistake was permissible here, no matter what its reason: negligence or fatigue. By the way, the percentage of errors in controlling space objects on the part of attendant personnel always was very low, and this was with daily work on many dozens of space vehicles. Discipline and responsibility always were high in the Space Command, Control & Telemetry Complex.

But back then in July 1965 the Proton station continued its flight and did not permit us to uncover the riddle of its silence, and a TASS Announcement appeared in the press which spoke of another victory of Soviet cosmonautics. These were not high-flown words, as there had been a victory. Even today, by the way, the Proton booster rocket is a reliable means for inserting heavy Mir craft into near-Earth orbit. That same announcement spoke of work to check onboard gear instead of the authorized words to the effect that scientific data were being processed.

(To be continued)

Soviet, U.S. Extravehicular Activity Table

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[Conclusion to article by G. Glabay under rubric "At the Readers' Request": "Outside the Craft"]

[Text]

No	Cosmonaut, Country	Spacecraft, Orbital Station	Date, Time Outside	Basic Results
63.	V. Savinykh, USSR	Soyuz T-13/Salyut-7	2 August 1985, 5 hr 00 min	Installation of two additional sections to third main panel of Salyut-7's solar battery.
64.	V. Dzhanibekov, USSR	Same as above	Same as above	Same as above.
65.	J. van Hoften, USA	Discovery	31 August 1985, 7 hr 08 min; 1 September 1985, 4 hr 20 min	Two spacewalks by the astronauts to repair LEASAT-3 satellite. Satellite repair successful.
66.	W. Fisher, USA	Same as above	Same as above	Same as above.
67.	S. Spring, USA	Atlantis	29 November 1985, 5 hr 32 min; 1 December 1985, 6 hr 38 min	Two spacewalks by the astronauts. Experiments were performed on assembling large girder constructions.
68.	J. Ross, USA	Same as above	Same as above	Same as above.
69.	V. Solovyev, USSR	Soyuz T-15/Salyut-7	28 May 1986, 3 hr 50 min; 31 May 1986, 5 hr 00 min	Two spacewalks. During the first the cosmonauts performed the Mayak experiment: they set up a girder opening and closing device and installed an onboard optical communications system. In the second they opened the opening and closing device, set up instruments on the girder for studying the "atmosphere" surrounding the orbital complex, welded girder parts with a multipurpose hand tool, dismantled the opening and closing device and installed in its place a microstrain device for testing structural materials under various loads. They removed the solar battery panel sample previously installed by Dzhanibekov and Savinykh and delivered it to the station.
70.	L. Kizim, USSR	Same as above	Same as above	Same as above.

71.	Yu. Romanenko, USSR	Soyuz TM-2/Mir/Kvant	From 11 to 12 April 1987, 3 hr 40 min; 12 June 1987, 1 hr 53 min; 16 June 1987, 3 hr 15 min	Three spacewalks. In the first, an unplanned one, they clarified the reasons for incomplete coupling of the Mir-Kvant connection. A foreign object was removed from the docking assembly. During the second the cosmonauts set up an extensible girder on a special installation unit and fastened two sections of photoelectric converters to it. In the third the cosmonauts set up a second solar battery unit and mated it with the first, and using special mechanisms they opened a solar battery 10.6 m long with an overall useful area of 22 m^2. In addition, they attached cassettes to the surface of the station with samples of various construction and thermal insulating materials.
72.	A. Laveykin, USSR	Same as above	Same as above	Same as above.
73.	M. Manarov, USSR	Soyuz TM-4/Mir/Kvant	26 February 1988, 4 hr 25 min; 30 June 1988, 5 hr 10 min; 20 October 1988, 4 hr 12 min	Three spacewalks. During the first, after unmating one of the two sections on the third solar battery, the cosmonauts set up in its place a new one intended for subsequent tests, placed a number of scientific instruments on the station's outer surface and dismantled samples of materials which had been exposed for a long time under outer space conditions. On 30 June they attempted to replace the detector on the TTM x-ray telescope. Work had to be put off because of the complexity of the fastening arrangement and lack of practice in such kind of operations on the ground. In the third spacewalk the cosmonauts removed a thermal insulating cover, freed an instrument from attachment elements, installed a new detector, connected electric cables to it and restored the thermal insulating cover of the module's skin. In addition, they set up an attachment device necessary for subsequent work on the outer surface of the transfer module, and they set up an antenna for amateur radio communications on the conical portion of the work module. Space suits of a new modification were used in the work.
74.	V. Titov, USSR	Same as above	Same as above	Same as above.
75.	J.-L. Chretien, France	Soyuz TM-7/Mir/Kvant	9 December 1988, 5 hr 57 min	The cosmonauts checked the possibility of deploying a girder structure in open space—a hexagonal cellular prism around 4 m high. Then they placed various materials on the outer surface of the station to study the lengthy effect of space on them.
76.	A. Volkov, USSR	Same as above	Same as above	Same as above.
77.	A. Serebrov, USSR	Soyuz TM-8/Mir/Kvant-1, -2	From 8 to 9 January 1990, 2 hr 56 min; from 11 to 12 January 1990, 2 hr 54 min; 26 January 1990, 3 hr 02 min; 1 February 1990, 4 hr 59 min; 5 February 1990, 3 hr 45 min	Five spacewalks. In the first the cosmonauts installed two star sensors on the scientific instruments bay of the Kvant astrophysical module. They removed panels from the side with samples of biopolymers and various construction materials. During the second spacewalk the cosmonaut removed panels installed 9 December 1988 with samples of various materials and sensors for registering micrometeorite flows. To receive the Kristall module they shifted the docking unit to the other hatch of the Mir station's transfer module and installed new cassettes with samples of composite materials and gear for injecting electron beams perpendicular to the Earth's magnetic field. In the third spacewalk they tested the new Orlan-DMA space suit, installed a sealed unit with a Japanese television camera on an external stabilized platform, and dismantled the Kurs approach system antenna. Fourth spacewalk. First test of a unit (a space "motorcycle") for moving in open space. Controlling the operation of its engines, Serebrov went up to 33 m away from the orbital complex and executed maneuvers, turns, and linear displacements in various planes. Fifth spacewalk. Second test of the unit. This time A. Viktorenko, moving along a precoordinated route, went 40-45 m away from the station and measured the radiation background around it using the Spin-6000 portable spectrometer.
78.	A. Viktorenko, USSR	Same as above	Same as above	Same as above.

79.	A. Solovyev, USSR	Soyuz TM-9/Mir/Kvant-1, -2/Kristall	17-18 July 1990, 7 hr 00 min; 26 July 1990, 3 hr 31 min	Two unplanned spacewalks. In the first, work was performed to attach damaged thermal insulation of the descent module. In three hours the cosmonauts covered around 30 m over the surface of the complex with ladders (straight and curved) and with a set of tools and video gear, added two out of three two-meter lobes of torn-off thermal insulation, inspected explosive bolts and checked sections of the connection of the descent module and the instrument bay. They returned after spending a sum total of around five hours (the operating time of the self-contained space suit is six hours), but they were unable to close the Kvant-2 module exit hatch behind them. The cosmonauts safely returned to the station after moving into the neighboring scientific instrument bay. The crew was secured in open space with the help of two snap hooks. In the second spacewalk, the cosmonauts used a television camera to show Earth the deformation of one of the hatch hinges, unhooked the ladders which had been left and fastened them aboard the Kristall. After several attempts they closed the exit hatch airtight at the recommendation of the central control station, but its use for taking the space "motorcycle" outside is problematical in the near future.
80.	A. Balandin, USSR	Same as above	Same as above	Same as above.

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